Metals Review

SCIENCE & TECHNOLOGY

March 1960

Joseph Sprainak
Columbus "Man of the Year"
(See Article, p. 4)

plan to attend!

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Metals Review

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Betty A. Bryan, Editor
A. P. Ford, Sales Manager
G. H. Loughner, Production Manager

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DISTRICT OFFICES
William J. Hilty
Rodney W. Cramer
Metals Park, Novelty, Ohio
JOrdan 4-2271

John B. Verrier, Jr.
Fred Stanley
342 Madison Ave., Room 1228
New York 17, N. Y.
OXford 7-2667

Donald J. Walter
53 West Jackson Blvd.
Chicago 4, Ill.
WAbash 2-7822

William F. Mills
(Whaley-Simpson Co.)
6608 Selma Ave.
Los Angeles 28, Calif.
HOllywood 3-7157

Gordon Simpson
(Whaley-Simpson Co.)
700 Montgomery St.
San Francisco 11, Calif.
SUtter 1-4533

•

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CONTENTS

Important Meetings

Departments

Dr. Spretnak Named Columbus "Technical Man of the Year"

One of the American Society for Metals' outstanding members has received another in a growing list of honors. Joseph W. Spretnak, noted for his accomplishments in metallurgical education, has been named "Technical Man of the Year" by the Columbus, Ohio, Technical Council, composed of 24 technical societies in the Columbus area.

Dr. Spretnak, holder of major awards of the American Society for Metals, was presented his latest distinction Feb. 25 at the Columbus Athletic Club by Paul Rogers, chairman of the Council.

A past chairman of Columbus Chapter A.S.M., Dr. Spretnak won the Society's Henry Marion Howe Medal in 1948 and was the first recipient of the Society's Teaching Award in 1952. He was selected one of eight outstanding educators at Ohio State University in 1954. A professor of metallurgical engineering, he has been a member of the Ohio State faculty since 1948.

In October 1957, he was a member of the United States metallurgical delegation which went to Russia in an exchange with the Moscow Steel Institute. He also lectured before the French Metallurgical Society in Paris in October 1958.

A native of North Industry, near Canton, Ohio, he received his bachelor of science degree from Ohio State in 1938, his master of science degree from Case Institute of Technology, Cleveland, in 1940, and his Ph.D. degree from the University of Pittsburgh in 1948.

Before joining the faculty of Ohio State, he was a member of the staff of the Metals Research Laboratory at Carnegie Institute of Technology, from 1943 to 1948. Prior to that he was a research metallurgist with National Malleable and Steel Castings Co., Cleveland, from 1940 to 1943.

His research at Ohio State has been concerned primarily with low-temperature properties of metals and alloys, oxidation of molybdenum, stress corrosion of stainless steels and hardenability mechanisms in steels.

A consultant to the metallurgy department of Battelle Memorial Institute, Columbus, he is the author of some 35 articles published in scientific journals and has contributed chapters to three technical books.

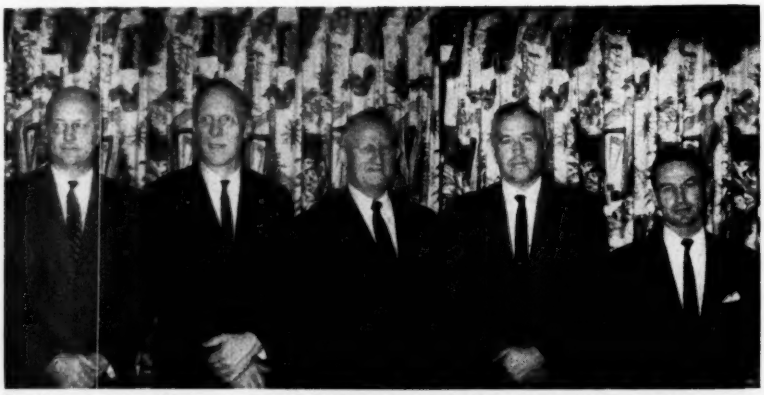
A member of Dr. Spretnak's first class at Ohio State University commented several years later: "I was a senior at Ohio State when Dr. Spretnak assumed his duties as an instructor. Even with his newness . . . he was well received and was soon accepted in good standing. I was well impressed with his thorough knowledge of metallurgy—both as a science and an art.

"Since it is natural in human endeavor to be attracted to a pleasant personality and to respect intelligence, Dr. Spretnak undoubtedly has exerted a large influence upon all who contact him".

Today, eight years later, that student's observations seem to be well taken, indeed.

Metals Review, in behalf of the American Society for Metals, is proud to salute Joseph W. Spretnak, Technical Man of the Year in Columbus.

A.S.M. Vice-President Guest at Worcester



Leaders at a Meeting of Worcester Chapter Included, From Left: H. J. Holmes, Vice-Chairman; S. M. MacNeille, Director of Research, American Optical Co.; W. A. Pennington, National Vice-President A.S.M., Who Spoke on "Mild Steel and Corrosion Service"; A. L. Stowe, Chairman; and Laurence T. Maher, Technical Chairman. Members and guests of the Chapter toured American Optical Co. facilities during the afternoon

Expand Russian Coverage

A further expansion of coverage of the Russian literature in the English language is being provided under sponsorship of *Acta Metallurgica,* the international journal of metallurgy sponsored jointly by the American Society for Metals and the Metallurgical Society of the A.I.M.E.

The Board of Governors of *Acta Metallurgica* has recently announced the publication in English of Part B of the U.S.S.R. *Abstracts Journal of Metallurgy,* known as "Technology of Metals". Part A, which has been available for some time under a similar arrangement, covers "Science of Metals". In these translations Western source material is omitted so that only abstracts originating in the U.S.S.R., the Satellites and China are translated.

The translated journals are prepared monthly, duplicating the monthly issues of the Russian abstract journal. Back issues of Part B are available for 1958 and 1959 as well as continuing in 1960. Part A is available for 1957 as well as 1958, 1959 and 1960. Both of the translated journals are under the editorship of Bruce Chalmers, editor-in-chief of *Acta Metallurgica.*

Acta Metallurgica also sponsors the complete translation of *The Physics of Metals and Metallography, U.S.S.R.,* and plans are under way for the translation and publication of a number of additional Soviet journals of interest to scientists of the Western World.

Through the aid of a grant from the National Science Foundation it is possible to offer these subscriptions at greatly reduced rates to individual members of the sponsoring societies, (A.S.M. and A.I.M.E.) and cooperating societies of *Acta Metallurgica,* including:

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Inquiries concerning prices and method of subscribing should be addressed to the Business Manager, *Acta Metallurgica,* Pergamon Press, Inc., 122 East 55th St., New York 22, N. Y.

The Metallurgist Versus Corrosion

Shown at a Meeting of Eastern New York Chapter Are, From Left: C. W. Reese, Chairman; H. H. Uhlig, Massachusetts Institute of Technology, Who Gave a Summary of "What a Metallurgist Needs to Know About Corrosion"; and A. V. Seybolt of the General Electric Co.

Speaker: H. H. Uhlig

Massachusetts Institute of Technology

A summary on "What a Metallurgist Needs to Know About Corrosion" was given by Herbert H. Uhlig, Corrosion Laboratory, Dept. of Metallurgy, Massachusetts Institute of Technology, at **Eastern New York.**

Because industrial corrosion problems are being referred increasingly to the metallurgist, there are certain basic facts he would do well to know. Concerning the corrosion of iron and steel, for example, he should know that in natural waters only accessibility of dissolved oxygen determines the rate. The rate is higher, therefore, at elevated temperatures and with increased stirring. Metallurgical factors, on the other hand, play little or no part. Hence, a cold worked or annealed steel, a martensitic or pearlitic steel, a low-alloy or carbon steel all corrode at the same rate. In specifying materials to withstand sea water, tap water or burial in the soil, the cheapest steel available to satisfy mechanical properties should be specified.

For steels exposed to waters in the acid range, metallurgical factors become important. Such exposures are encountered in steam return lines where hot carbonic acid is corrosive, or in tin-plated steel cans as food containers, or in acid oil-well brines. For such environments, cold work increases corrosion, a tempered martensite corrodes much more rapidly than either martensite or pearlite, and many low-alloy steels have advantages over carbon steels.

Stainless steels or Duralumin-type alloys will corrode intergranularly if improperly treated. There is as yet no metallurgical remedy for pitting susceptibility of stainless steels in chloride-containing environments such as sea water. Addition of 4% chromium to a low-carbon steel diminishes depth of pits, but the effect is relatively mild, and usually not justified economically.

For dezincification of brasses, the addition of alloyed tin, arsenic, antimony or phosphorous are beneficial as inhibitors. Brasses containing less than 15% zinc without such additions are practically immune.

In corrosion failures by cracking, corrosion fatigue is usually always a transgranular fracture, and metallurgical additions which increase strength are sometime helpful but not always. A corrosive envirionment may eliminate the endurance limit following which there is no stress below which the structure will not fail if cyclically stressed a sufficient number of times. With stress corrosion cracking of brasses, cracking is intergranular but occurs only when the alloy is stressed in tension and in contact with ammonia or a substituted ammonia atmosphere. Nothing can be done in the way of alloying to avoid this type of failure, so far as present knowledge goes. Stress relief is the commonly accepted metallurgical procedure for handling cold worked brasses, a remedy which applies to most other metals as well.

Carbon steels stress corrosion crack largely in alkalies or nitrate solutions and a few specialized environments. Reduction of nitrogen and carbon contents of steel is beneficial. Similarly for the austenitic stainless steels, reduction of nitrogen content considerably increases resistance to stress corrosion cracking in hot chloride solutions such as magnesium chloride.

Fretting corrosion is a special type of attack which occurs at the interfaces of highly loaded surfaces slipping slightly with respect to one another. Damage is in the form of pits leading to fatigue failure. This damage can be minimized by avoiding slip, or excluding air from the interface, or by using a soft material, such as tin or cadmium at the interface, or a gasket with low coefficient of friction, such as teflon.

For increasing oxidation resistance of ferrous materials at high temperatures, alloying with chromium and aluminum are the important additions, with increasing benefit being obtained by combinations with nickel or silicon or both. Current basic research on semiconductors promises to be of help in the understanding of oxidation mechanisms because oxidation products such as oxides and sulphides are essentially semiconductors. High-temperature surfaces should in general operate above the dew point for longest life; substances which lower the melting point of protective oxide scales should be avoided.

The metallurgist should know the chemical distinctions between aluminum and steel in many of the applications for which aluminum is now recommended. In general, aluminum is not a satisfactory material in contact with waters containing traces of copper and other heavy metals. For distilled water it is satisfactory. It should not be used in contact with alkalies, and should never, therefore, be buried in fresh concrete or in contact with lime. Contact with mercury or mercury salts should be rigorously avoided. Aluminum tends to pit in sea water; it should never be used in contact with anhydrous chlorinated solvents such as carbon tetrachloride or trichlorethylene in degreasing units or in storage tanks, at least without a suitable inhibitor being added. Rapid corrosion of aluminum in such solvents has more than once resulted in catastrophic damage by fire or explosion.—**Reported by L. Ianniello for Eastern New York.**

Reviews European Rail Equipment at Denver

Speaker: Ray McBrian

Denver & Rio Grande

Ray McBrian, director of research for the Denver & Rio Grande Western Railroad Co., discussed details of his 1959 trip to Europe before the **Rocky Mountain Chapter.**

European railroads, particularly those in France, are becoming very interested in automation. Mr. McBrian told of a Baldwin diesel switcher near Paris which was completely controlled by microwaves and needed no train crew. Programs are also in effect to reduce maintenance costs. An example of this effort is the use of a concrete tie rather than wood which more than doubles the life of the tie. The trend in design throughout Europe is to eliminate or reduce shock and vibration as much as possible by use of an absorbent material such as rubber. A great deal of strain gage testing is being done to isolate stress components and correct them if necessary.

Other devolpments discussed were hydraulic drive locomotives, flywheel drive locomotives and buses, nickel-plated cylinder liners, special mufflers, oil-free compressors and supercharger elimination by bypassing exhaust gases into the intake manifold. —**Reported by L. G. Loseke for Rocky Mountain (Denver).**

A.S.M.'s Documentation Service to Triple Searching Program

(With Comments From Our Files)

After only three months actual operation the American Society for Metals Documentation Service is now able to triple the scope of its revolutionary new Information Searching program for the metal industry.

In addition to the basic 12,000 digests of metallurgical articles presented annually in the A.S.M. *Review of Metal Literature,* subscribers to the service can now receive digests of thousands of documents representing fields closely allied to metals, such as chemistry, mathematics, mechanical and electrical engineering, business and finance. The expanded service will be able to search and select from nearly 40,000 digests of articles of direct and allied interest to the metals man.

NOW SEARCHING PATENTS

Perhaps the most significant new area to be covered by Information Searching is the field of government reports and patents. Metals men involved in research realize the value of the information buried in patents and official documents. However, because of the staggering number and complexity of these documents, the information they have needed has been difficult, at times impossible, to unearth. Conventional searching tools have proved woefully inadequate in harnessing the mushrooming output of technical literature for technological progress.

"We congratulate you on this forward-looking step and wish you every success in this new endeavor. We believe a service such as you are offering will be of material benefit to us and many other research laboratories".

Now however, every patent and government report of even the slightest interest to the metals technologist is being transcribed in the form of pertinent digests and encoded on electronic tape. From then on, its searching operation is strictly mechanized, fully automated. The tapes are fed through a new data processing system, specifically designed for Information Searching, which sorts out the subjects of importance to the subscriber in his pursuit of technical information. The subscriber's question may be as broad as "steels", or as definitive as "properties of stainless steel for temperatures down to —423° F." The Information Searching Selector detects virtually every mention of the specified subject area published in the world's literature.

EVERY TWO WEEKS

What does this mean to the man needing complete and accurate technical information? It means he can now receive by mail every two weeks a selection of digests of articles on his field of interest. Every two weeks he will have at his fingertips information which would require hours of tedious conventional library work to find. In addition, he will have much valuable information which could not be gained by conventional means.

"This endeavor is most worthwhile and of interest to us. . . . . ."

Marjorie R. Hyslop, editor of the A.S.M. *Review of Metal Literature* and in charge of A.S.M.'s new Documentation Service, estimates that mechanized literature searching on an industry-wide scale conceivably could save industry as much as $500,000,000 a year, based upon the enormously rising costs involved in research. She points to the estimated cost of $40,000 per year just to maintain one qualified man in a laboratory.

The recognized major drawbacks in the use of conventional literature searching methods, she says, are slowness and impossibility of complete coverage—drawbacks which tend to discourage *any* literature searching prior to experiments, thus increasing the danger of wasteful duplication of experiments. A.S.M.'s Information Searching, she continues, will significantly reduce this danger by engendering an awareness on the part of researchers of the work being done by others.

NSF ADDS SUPPORT

The broader new searching of 40,000 digests annually comes as a result of the National Science Foundation's recent grant of $159,000 for the first year of a projected 2½ year test program to Western Reserve University in Cleveland, which has been developing the new mechanized metallurgical literature searching service at the instigation of the American Society for Metals. A series of Society grants to Reserve starting in 1955 now totals over $100,000. A.S.M. was first to recognize the need to mechanize the searching of technical literature and first to provide an operational service of its type. And now, A.S.M. subscribers will have the benefit of the many additional abstracts made possible by the National Science Foundation grant.

"Data retrieval, as a relatively new field, holds great promise in alleviating the drudgery of seeking out information manually; however, few existing systems that I am familiar with show the capability inherent in device described in the 'Times' article".

Up to this time, the service has utilized an experimental searching selector built by Western Reserve. Later in the year, however, the new GE-250 Information Searching Selector will be delivered, installed and operating. This new machine, first of its kind, is able to scan 100,000 encoded digests an hour, assuring rapid, up-to-date service to subscribers.

JUST ASK A QUESTION . . .

Information Searching is a personal service, tailored specifically to the needs of the individual subscriber. It's a matter of asking the machine a carefully phrased question. An individual search on each question is made every two weeks. Everything which the machine turns up regarding the question is quickly sent to the subscriber in the form of brief digests of articles and documents of interest to him. The subscriber is then able to read quickly through these digests and order photocopies of articles which may be helpful to him in his research activity area.

"Your service has enormous possibilities and I wish you continued success. If there were a service like yours in each branch of science, for example, I believe the impact upon research advancements would be tremendous".

Scores of inquiries have been received already regarding ASM/DS, and searches have begun for a number of subscribers. Each subscriber receives individual consultation to insure the most accurate possible phrasing of his question.

FAST, THOROUGH, ECONOMICAL

This service of digests every two weeks, according to a recent announcement, is available at a fee of $50 per month (three month minimum subscription), plus 10c for each digest

Describes Grain Boundary Properties

Shown at a Meeting of the Canton-Massillon Chapter Are, From Left: Clarence D. Huff; Jack A. Rinebolt, Technical Chairman; K. T. Aust, General Electric Research Laboratory, Who Spoke on "Structures and Properties of Grain Boundaries"; and George P. Michalos, Chairman

Speaker: K. T. Aust
General Electric Co.

Experimental observations concerning the "Structures and Properties of Grain Boundaries" were discussed by K. T. Aust, metallurgy and ceramics research department, General Electric Co., at a meeting of **Canton-Massillon Chapter.** These boundary properties included energy, etching, diffusion, migration, segregation and shear.

The energy measurements are in disagreement with the concept of a completely disordered boundary structure and support the transition boundary structure, at least for angles of misorientation as high as 6 to 35°, depending on the material. Since the energy of *large-angle* grain boundaries is apparently independent of orientation difference, this suggests that large-angle boundaries might still have a completely d i s o r d e r e d structure. However, diffusion studies along grain boundaries have demonstrated that even large-angle boundaries exhibit different diffusion behavior and marked anisotropy of diffusion, and consequently, large-angle boundaries cannot have a completely disordered structure.

In addition, some recent experiments on grain boundary migration in zone-refined lead have shown that different large-angle boundaries may have different kinetics in the presence of solute impurity, and their structures must, therefore, be considerably different. The dependence of grain boundary shear on boundary angle was also observed for large-angle grain boundaries. These observations on diffusion, migration and shear indicate that different large-angle boundaries do not have a completely disordered structure. Since structural differences exist between various large-angle boundaries, a transition structure must still be present.

The problem still remaining is to determine what type of transition structure exists at the various grain boundaries. Low-angle boundaries with orientation differences less than 1° have been found to consist of dislocations, as shown by direct observation of dislocation sites in a boundary by etching techniques and by use of the electron microscope for thinned foils. Boundaries with orientation differences of the order of 1° have been shown to consist of dislocations by experiments on boundary motion in zinc. For boundaries with orientation differences from 1 to about 10°, grain boundary energy measurements have provided evidence that they also consist of dislocations.

There is still no useful model for the transition structure of large-angle boundaries which will satisfactorily account for all the observed grain boundary properties. The dislocation model of the boundary is believed to break down somewhere in the range of orientation difference between 10 to 20°. However, grain boundary energies have been observed to increase continuously with increasing orientation difference up about 30° for silver.

Also Mr. Aust pointed out, diffusion about 30° for silver. Also, diffusion studies do not indicate any abrupt change in the transition structure of the boundary. This suggests that perhaps a more complicated dislocation-type of structure may be present in the boundary.—**Reported by John Savas for Canton-Massillon.**

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provided. Photocopies, when desired, are 50c a page. This nominal fee compares favorably indeed with the cost of a conventional search—about $7.50 an hour plus typing and clerical labor. But the important thing is that the new service offers complete literature searching, overlooking no published material of importance to the researcher and technologist.

"I cannot commend the Society too warmly for pioneering in the machine indexing and searching of the literature relating to the metals field".

"We are greatly impressed with the searching services which will soon be available through your new organization".

BIBLIOGRAPHIC SEARCHES

A.S.M.'s Documentation Service also offers bibliographic searches, providing subscribers with information published over a longer period of time. The longer the service is in operation, of course, the more years can be included in the bibliographic search. At present, digests can be provided for literature published over the past two years. The cost for this service is $100 for the first 12,000 digests searched, plus $50 for each additional 10,000 digests.

ENCODED TAPES

An even more personalized service is available to concerns wishing to have their own searching machine. Here encoded tapes representing literature for an entire year are available, enabling specific searches at any time, with answers provided immediately. This will also facilitate the encoding of confidential material or material not available through A.S.M.

"You are to be congratulated on the development and initiation of this type of service to industry. I realize the efforts and energies that have been required to reach this stage of development. We are anticipating the use of these services".

The Society is convinced of the manifold benefits to be gained through this faster, more thorough and up-to-date method of searching literature, and of the tremendous boost it will give to the progress of metals technology. And although metals are the first to gain, the method has obvious application in other fields such as medicine, law and business.

This important work has only begun.

Los Angeles Plans Regional Conference on Refractory Metals

Sparked by the success of the Molybdenum Fabrication Conference held in Los Angeles two years ago, the Educational Committee of the Los Angeles Chapter, American Society for Metals, has arranged a Regional Conference to be held Thursday and Friday, May 12-13, at Santa Monica, dealing with one of the most important groups of materials in defense technology, "The Refractory Metals".

Committee Chairman and Los Angeles A.S.M. Executive Committee member R. H. Gassner, chief metallurgist of the El Segundo Plant of Douglas Aircraft, and his Committee have virtually completed the program arrangements, which will include addresses by the leading authorities in the field from the Nation's industry, research centers and government. Speakers representing industry are expected from Boeing Airplane Co., Allegheny Ludlum Steel Corp., Ladish Forge Co., Aerojet-General Corp., General Electric Co. and the Marquardt Corp.

Government agencies will be represented by speakers from the Lewis Flight Propulsion Laboratory (NASA), Bureau of Aeronautics, National Research Council and the Jet Propulsion Laboratory of California Institute of Technology. Representatives of Armour Research Institute, Southern Research Institute and Battelle Memorial Institute will discuss work in the field done at these important research centers.

The selection of "The Refractory Metals" as the theme of the Conference is a recognition of the rapidly growing importance of these metals in space and missile technology. Although molybdenum, columbium, tungsten, rhodium, rhenium and tantalum have been known in the past to metallurgists as alloying additions to other metals, the emergence of these materials as structural members in themselves has been of recent origin. Because of the pressure of time in the defense field, concentrated attention to these metals has telescoped the normal progress of their development, but there still remains much to be learned about them and how they can be used most effectively.

The Los Angeles Chapter regards this Conference as a significant contribution to assisting in this future progress and anticipates heavy attendance and participation at the two-day series of discussions.

The program has been carefully established to cover essential interests in the important fields of use, testing and production. Discussions are planned on the state of the art in the application of these materials and of the design concepts that experience with them has thus far shown. The status of these materials in terms of availability, from ore to finish products, will be explored. Experience in the application of the standard manufacturing practices of working, joining, forming, machining and heat treatment will be covered. The important field of testing these metals above 2000° F., a technology in itself of primary importance to assure reliability, will be discussed by a panel composed of outstanding experts in the field of testing.

To be held at the beautiful Hotel Del Mar in Santa Monica, the Conference will offer an opportunity to obtain the latest and most authoritative information available on these important metals to those responsible for the selection, manufacture and application of materials to satisfy the new and stringent performance requirements necessary for effective and economical progress in space technology.

Announcements regarding registration arrangements will be made in the near future to the A.S.M. membership, and will be carried in trade publications. Preliminary inquiries, however, may be directed to Mr. Gassner, to the A.S.M. office at 520 W. 7th St., Los Angeles 14, Calif., or by calling MAdison 3-1639 in Los Angeles.

Cleveland Chapter's Officers

1950-1960 Officers of the Cleveland Chapter Shown During a Recent Meeting Include, From Left: A. J. McCullough, Vice-Chairman; R. M. Baker, Treasurer; John M. Fox, Secretary; and J. P. Long, Chairman

Reviews Bearing Materials At Hartford Chapter Meeting

Speaker: Henry Hubble
Fafnir Bearing Co.

Henry Hubble, technical development manager, Fafnir Bearing Co., and current treasurer of the **Hartford Chapter,** spoke at a recent meeting on "Bearing Materials".

His talk covered metallurgical requirements, procurement and quality assurance testing of materials used for conventional and extreme service ball bearings. The basic requirements for ball-bearing materials include the ability to be heat treated to high hardness and abrasion resistance. In the case of bearings to be used in elevated temperatures, the materials must have reasonably good hot hardness and reluctance to tempering.

Quality assurance testing begins at the steel mill where heats of steel are selected by suitable testing to insure sound, clean stock. Tests include deep etching of billet and rod end slices, magnetic particle inspection of stepped bars, microscopic inspection and fracture testing. Much attention is given to the effort of selecting stock which is as free of nonmetallic inclusions as possible. It has been shown that the average life of bearings increases as the degree of cleanliness increases. Materials such as vacuum melted alloys are continuously under study, the goal being to reduce scatter in bearing life. The improvement in bearing integrity realized through the use of vacuum melted stock is felt to be due to its improved cleanliness and superior transverse properties.

Bearing materials for elevated temperature applications currently in use or under study are M50 semi-high speed toolsteel, Mo-modified 440C stainless steel, a cast cobalt-base alloy, "Star J" and titanium carbide.

Mr. Hubble summarized by making the point that high integrity bearings result only from a combination of good material quality, adequate inspection, logical design and good metallurgical practices.—**Reported by F. M. Lister for Hartford Chapter.**

West Michigan Features Panel Meeting

A Panel Which Discussed "Revising Our Thoughts on the Selection of Materials" at a West Michigan Meeting Included, Standing, From Left: John B. Campbell, Materials in Design Engineering, *Moderator; and Charles E. Laitsch, Chairman. Seated are panelists W. Babington, Bell Telephone Laboratories; R. C. Gerhan, Republic Steel Corp.; and J. E. Teagarden of the Polychemicals Department, E. I. du Pont de Nemours*

The West Michigan Chapter presented a panel discussion on "Revising Our Thoughts on the Selection of Materials". John B. Campbell, managing editor, *Materials in Design Engineering,* was panel moderator. Panel members were Willard Babington, supervisor of metals engineering group, Bell Telephone Laboratories, who covered nonferrous materials, Richard C. Gerhan, Detroit Metallurgical Division, Republic Steel Corp., who spoke on steel, and John E. Teagarden, industrial specialist, market development section, Polychemicals Dept., E. I. du Pont de Nemours, who covered the subject of plastics.

Mr. Campbell pointed out that although stylists and industrial designers in some cases force engineers to turn to new materials, there are plenty of good reasons for voluntarily re-examining materials selection practice; these reasons boil down to money—money saved by the manufacturer or by the customer who buys the product. He cited several examples where appreciable savings have resulted from a simple change in materials.

One difficulty, according to Campbell, is that it is hard for an engineer to be sure that he has not overlooked a suitable engineering material or process. He suggested the use of a checklist, and that more effort be put into establishing rating lists for materials with respect to particular properties. For example, a list of the common engineering materials rated in decreasing order of yield strength would be helpful. Although some such lists have been published, virtually nothing has been done in the way of publishing rating lists based on efficieny ratios. Using seven common engineering materials as a basis, Mr. Campbell showed that the order of efficiency changes markedly as you consider, first, simply yield strength, then yield strength divided by specific gravity, and finally, yield strength divided by both specific gravity and cost.

Such ratios, according to Mr. Campbell, offer at least a partly quantitative approach to initial selection of materials. More sophisticated ratios would be required for many applications, provided the needed data were available.

However, many other factors must be considered besides efficiency. Among these are processing costs, availability, reliability of properties and aesthetic considerations.

Following Mr. Campbell's talk, each panel member discussed briefly his respective subject, after which a lively question and answer period developed.—**Reported by Donald J. Gerken for West Michigan.**

MAKE A DATE FOR DALLAS

Second Southwestern Metal Exposition and Congress Will be Held in

Dallas . . .

May 9-13, 1960

National Metal Show To Stress Basic Metallurgical Needs

A metals personality and atmosphere will underline every aspect of the American Society for Metals' 1960 Metal Show, to be held the week of Oct. 17 in the Philadelphia Trade and Convention Center.

Allan Ray Putnam, A.S.M. managing director, states that exhibitors and visitors alike will come from 11 well-defined categories of the metal industry, according to the needs of A.S.M.'s 31,000 members.

This emphasis on the essential materials of industry, in Mr. Putnam's opinion, provides unsurpassed opportunity for the intensive person-to-person interchange of knowledge and ideas in the Metal Show.

THE STEEL ARENA

A prime example of this renewed emphasis is the Steel Arena, a featured exposition area planned for the 1960 Metal Show. Here will be represented the steel industry of America, calling attention to the technological needs of all engineering materials.

11 BASIC CATEGORIES

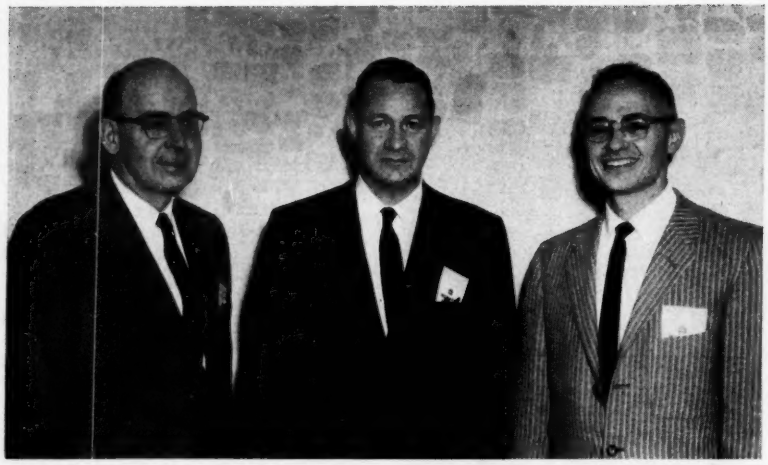
Plans for the Philadelphia Metal Show, officially known as the 42nd National Metal Exposition and Congress, are based upon the requirements of 11 major industrial categories, as follows:

1. Ferrous metal producers and distributors.
2. Nonferrous metal producers and distributors.
3. Related engineering materials.
4. Nuclear materials and equipment.
5. Tool materials, cutting-off and forming equipment.
6. Industrial heating equipment and supplies.
7. Cleaning and finishing equipment and supplies.
8. Welding and joining equipment and supplies.
9. Testing, inspection and control equipment and supplies.
10. Production and casting equipment and supplies.
11. Parts, forms and shapes for design and application.

TECHNICAL SESSIONS

The technical sessions of the American Society for Metals also will place broad emphasis on the engineering aspects of metals, with sessions to be held at the Society's headquarters hotel, the Bellevue-Stratford, and at the exposition hall itself.

Many other national technical societies will present sessions during the National Metal Congress in Philadelphia, held concurrently with the National Metal Exposition.



Allen G. Gray, Editor of Metal Progress, *Presented a Talk on "Space-Age Demand on Metals" at a Meeting Held in Buffalo. Shown are, from left: A.S.M. President Walter Crafts; Dr. Gray; and Harry Jamesson, vice-chairman*

Describes Space-Age Demands On Metals

Allen G. Gray

Metal Progress

Allen G. Gray, editor of *Metal Progress*, spoke in Buffalo on "Space Age Demand on Metals".

Metals for the astronautic era will be subjected to many different environments: ozone, extremes of temperature, high vacuum, solar radiation, cosmic radiation, ionized gases, meteoric bombardment, and zero gravity (effects on metals uncertain). Indirect effects would be leakage through seals, evaporation of liquids, and all metals will gall.

Metals for space use should have a high melting point, good heat dissipation, good ductility and elongation and minimum density possible. Light weight with high strength is desirable since space engineers calculate that it takes 1000 lb. of thrust to put 1 lb. into orbit.

The Atlas missile, 60 ft. long and 10 ft. in diameter from the propulsion section to nose cone, is of stainless steel sheet, type 301, 60% cold rolled, and has no internal framework. By special fixtures and welding techniques, the sheets are butt welded, welded areas roll-planished and reinforced with the same gage sheet resistance spot welded over the inner surface of the butt welded joints. The welded joints have the same strength as the parent metal. When the bulkheads are welded in place, the tanks are pressurized with nitrogen, a few pounds above atmospheric, then the supporting structures are removed. The missile body is rigid enough to resist bending loads and can be handled and transported. A titanium sphere (6% Al, 4% V) containing helium is immersed in liquid nitrogen at —320° F. The helium is released to pressurize the missile and operate components.

The X-15 space ship has an all welded Inconel skin. It will probe the outer edges of space (approximately 700 miles) and will reach a speed of 5000-6000 mph. coming down.

A new alloy, 25% Ni-2-6% Ti, is air hardening and is reported to have tensile strengths over 250,000 lb., 6% elongation and hardness as high as Rc. 67. The process of "ausforming" brings 4340 steel to a tensile strength of 300,000 lb. The martensitic stainless steels have very high strength but are difficult to heat treat, fabricate and weld. Progress is being made in fabrication by using the precipitating hardening 17-7, 17-7 Mo, and the newer alloys, AM 350 and AM 355.

New developments in the light metals are aluminum X2020 (4.5% Cu; 1.1% Li; 0.20% Cd; 0.20% Mn), and an all-beta titanium alloy (13% V; 11% Cr; 3% Al). The all-beta titanium alloy is heat treatable and if it can be brought to the same strength level as the precipitating stainless steels, a saving of almost 50% in weight could be made.

Because of atmospheric re-entry of space objects, the thermal properties of materials become important. New concepts of thermal protection employ heat sink properties and materials for ablation, sublimation and transpiration systems. In transpiration, a porous skin is used, the heat generated is dissipated by evaporation of a substance through the skin. Most efficient is lithium (30,000 BTU/lb.). Liquid helium or hydrogen could also be used.

In ablation, a part of the structure is slowly destroyed to save the more important structures. Materials for this are tested in a "plasma jet". The plasma jet attains a temperature of 10,000 to 30,000° F. A gas, usually argon or helium, is passed through a high energy arc which knocks off electrons; the gas is then forced through a round hole in an electrode where the electrons recombine under very high velocity creating the high temperature. Movies of the ablating properties of Al, Cu, stainless steel, nylon, linen, bakelite and graphite at 20,000° F. were shown. Aluminum had the poorest and graphite the best ablating properties.

Until newer alloys can be developed, we must work with the materials we have now and learn more about how to use them. Heat and weight are the biggest problems to overcome for space flight.—**Reported by M. M. Hughes for Buffalo.**

Southern Metals Conference Features "The Road Ahead"

Final plans and the completed program for the Southern Metals Conference scheduled for Apr. 18, 19 and 20 in Birmingham, Ala., have been released. The theme of the conference is "Metallurgy — the Road Ahead". Sessions are to be held in the Dinkler-Tutwiler Hotel.

Eleven technical papers and a technical tour will feature the program, according to J. R. Kattus, chairman of the 1960 conference committee. The technical tour will be held on the afternoon of Tuesday, Apr. 19, and will cover the Fairfield Steel Works and Tin Mill.

The conference program will be opened by R. J. Raudebaugh, International Nickel Co., national treasurer A.S.M. Papers to be presented include:

Steel, Cast Ferrous Materials, Vacuum Metallurgy, Nuclear Metallurgy, Metallography, Unique Fabricating Methods, Welding, Surface Treatment and Corrosion, Light Metals, Refractory Metals and Statistical Design.

Several social events, including a complete ladies' program have been scheduled. These include a social hour and buffet dinner Monday evening and a social hour and banquet Tuesday evening.

Further details concerning the program can be obtained through Mr. Kattus at the Southern Research Institute, 2000 Ninth Ave. S., Birmingham, Ala.

Panel Reviews Heat Treating Methods

Members of the Boston Panel on "Selection of Heat Treating Methods" Included, From Left: L. G. Field, Greenman Steel Treating Co.; Harry Dixon, Metallurgical Products Co.; C. F. Burling, Sales Manager, Lindberg Engineering Co.; and L. B. Rosseau, President of the Ajax Electric Co.

A panel-type meeting on "Selection of Heat Treating Methods" held by **Boston Chapter,** featured L. B. Rosseau, president, Ajax Electric Co., who spoke on "Salt Baths"; C. F. Burling, sales manager, Lindberg Engineering Co., who discussed "Atmosphere Furnaces"; L. G. Field, general manager, Greenman Steel Treating Co., whose subject was "Induction and Flame Hardening"; and Harry Dixon, Metallurgical Products Co., moderator.

Mr. Rosseau explained the merits of salt bath heat treating. Among the many features of this type of equipment he cited the speed and uniformity with which a piece can be heated or quenched in salt. This, he said, results in smaller changes in shape and less distortion, plus freedom from scale, decarb or carburization. Parts made from different analyses can be heat treated in a salt bath at the same time. It is common to have salt bath furnaces, in related groups, operated by fully integrated compact mechanisms. Some of these mechanized lines have been installed in areas too small and crowded for any other type of equipment to be considered.

Mr. Burling stated that the term "controlled atmosphere" has been used for many years, but only recently has it been truly descriptive of the process. Originally it designated simply the displacement of air in a furnace with something else, and frequently it meant only the adjustment of a burner to develop a reducing character to the products of combustion. Today the word "controlled" has real significance, when combined with atmospheres related to heat treatment. Instrumentation for control has undergone rapid development as knowledge of this factor has been extended.

When a problem of maintaining the chemistry of a metallic part presents itself today in a heating operation we have a great many atmospheres for consideration. Selection is normally based on lowest cost compatible with desired results. Mr. Burling cited as available atmospheres: five gases prepared from hydrocarbons; three gases prepared from ammonia; four pure gases; and mixed gases for use in carburizing, carbonitriding and nitriding.

Applications and relative costs for these gases were discussed. Mr. Burling showed that atmospheres are simple and easy to handle, that they lend themselves to automatic control and provide a wide range of flexibility.

Mr. Field stated that both salt baths and controlled atmosphere furnaces are important tools. To complete the picture on available processes, Mr. Field discussed heat treatments by flame hardening and induction hardening. Both procedures have applications where their particular form of heating is the most economical, and in some cases the only practical way of heating a part.

A lively question and answer period followed the talks. The excellent turn-out of the members showed that interest in matters concerning heat treating is still very active.—**Reported by Daniel A. Black for Boston.**

Technical Papers Invited for A.S.M. Transactions

The Transactions Committee of the A.S.M. is now receiving technical papers for consideration for publication in the Transactions of the Society and possible presentation before the next national meeting of the Society, in Philadelphia, Oct. 17 to 21, 1960.

Many of the papers approved by the Committee will be scheduled for presentation on the technical program of the 42nd National Metal Congress and Exposition.

Papers may be submitted any time up to Apr. 15, 1960, for consideration for presentation at this convention. The selection of approved papers for the convention technical program will be made in May 1960. Manuscripts may be submitted any time during the year and upon acceptance by the Transactions Committee will be processed immediately for preprinting. All papers accepted will be preprinted and made available to any members of the Society requesting them. However, the printing of an accepted paper does not necessarily infer that it will be presented at the convention.

Reprinting of accepted papers is done quarterly; notification of their availability is published in *Metals Review*.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of T. C. DuMond, field secretary and program coordinator, American Society for Metals, Metals Park, Novelty, Ohio.

Should it be your intention to submit a paper, please notify A.S.M. A copy of the booklet entitled "Suggestions to Authors in the Preparation of Technical Papers" will be gladly forwarded. This booklet may help considerably in the preparation of line drawings and illustrations.

Meet Your Chapter Chairman

TEXAS

W. D. GILDER claims Cleveland, Ohio, as his birthplace. A staunch supporter of A.S.M. for the last 30 years, he has held offices in the Cleveland and Texas Chapters, and is presently a national director on the Handbook Committee. He has written a number of articles for technical journals and is affiliated with other technical societies.

Mr. Gilder received his B.S. degree at Notre Dame and his M.S. degree in metallurgy at Carnegie Tech. His early training began at the U. S. Steel Corp., where he went through all phases of metallurgical training and operations before leaving to join the Weatherhead Co. as chief metallurgist. For the last five years he has been associated with the Reed Roller Bit Co. as chief metallurgist.

Since giving up his favorite Cleveland Indians, Mr. Gilder has become an avid booster of the Buff's Baseball Club. He is a strong supporter of his Church's Boy's Athletic League and expects to manage the Little League team before long. In his spare time he manages to keep up with lawn tending and is very proud of the excellent condition of his property. Since coming to Texas Mr. Gilder has been made a deputy sheriff by Sheriff Buster Kern.

NORTHWESTERN PENNSYLVANIA

IVAN C. MARSTELLER is a true native of Pennsylvania. He was born in Fredonia, acquired his B.A. degree at Thiel College and took postgraduate metallurgical courses at Carnegie Tech and Penn State. His first position was with Talon, Inc., Meadville, Pa., as metallurgical assistant. He then went to Parker Appliance Co. as chief metallurgist and later joined Pesco Products as product metallurgist. After a few years with Willys Motors Inc., Erie, Mr. Marsteller took his present position as supervisor of the quality control laboratory, General Electric Co.

An A.S.M. member for 17 years, he has been on the executive committee for six years, chairman of the education committee for four years and has served on the membership, program and yearbook committees.

Mr. Marsteller is lay leader and chairman of the official board of the Kingsley Methodist Church. He has three children and for recreation he enjoys bowling and golf.

ROCHESTER

FRANCIS J. GEHRLEIN comes from Erie, Pa. After extension courses in metal processing at Technical High School, Buffalo, and in metallurgy at Rochester Institute of Technology, he took his first job at Edgar T. Ward's Sons Co., Buffalo. He was there about 15 years in various positions, including office manager, then went to Brace-Mueller-Huntley, Inc., Rochester, where he is now manager of nonferrous sales.

An A.S.M. member for 11 years, Frank has served on various committees, the last five years on the executive committee, and as assistant secretary and vice-chairman. He is a member of the American Society of Tool Engineers and the Opportune Club of Rochester.

His interests include gardening, but the most important ones are two grandchildren.

MAHONING VALLEY

J. GILBERT CUTTON, chief process metallurgist, Youngstown District Works, U. S. Steel Corp., comes from Rochester, N. Y. After receiving his B.S. degree in metallurgical engineering at Rennsselaer Polytechnic Institute, he joined Carnegie-Illinois Steel Corp, Youngstown. In 1943, he transferred to U. S. Steel Corp. Research Laboratory at Kearney, N. J. for a year, then moved on to the Youngstown District Works in various positions, including maintenance metallurgist and chief control and development metallurgist before taking his present position.

An A.S.M. member for 15 years, Mr. Cutton has been co-author of papers for the A.S.M. Transactions, and in 1956 was the Marcus Grossmann Lecturer. He has also served as chairman of the publicity committee and as vice-chairman. He has two daughters, Martha 12, and Linda, 8 years old.

NORTH TEXAS

STEPHEN MASZY comes from Harco, Ill. His metallurgical engineering degree is from the Colorado School of Mines and he is now lead structures materials engineer with Chance Vought Aircraft, Inc., Dallas. Before taking his present position he had a variety of experience with Aluminum Co. of America, Chrysler Corp., Trenton Corp., Convair at Fort Worth and Bessemer Forging Co.

Two years before taking office Mr. Maszy was secretary and treasurer of his chapter, and he has also been chairman of the educational committee. He is a member of the Society for Nondestructive Testing and the Elks Club. He has a family of one daughter and three sons.

DETROIT

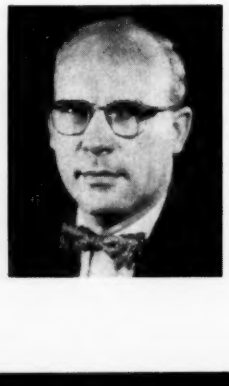
DON HENRY has been a member of A.S.M. for about 20 years. Born in Columbus, Ohio, he received his M.S. degree from Ohio State University and a B.S. degree from Otterbein College. Following graduation Mr. Henry was with Central Ohio public schools for two years, then went to Battelle Memorial Institute as a Research Fellow. In 1937 he joined General Motors Corp., where he is now assistant head, metallurgical engineering department, research laboratories, Warren.

He has been continuously active in Chapter affairs, on the executive committee and as program and educational chairman. At the national level, Mr. Henry was appointed a member of the Campbell Lecturer Committee by C. H. Lorig, immediate past-president A.S.M., and he is also active in other technical societies. Golf and gardening are his recreational interests.

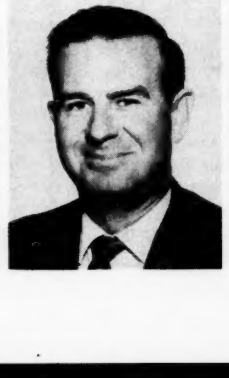
F. J. Gehrlein

W. D. Gilder

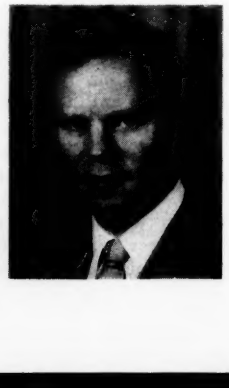
J. G. Cutton



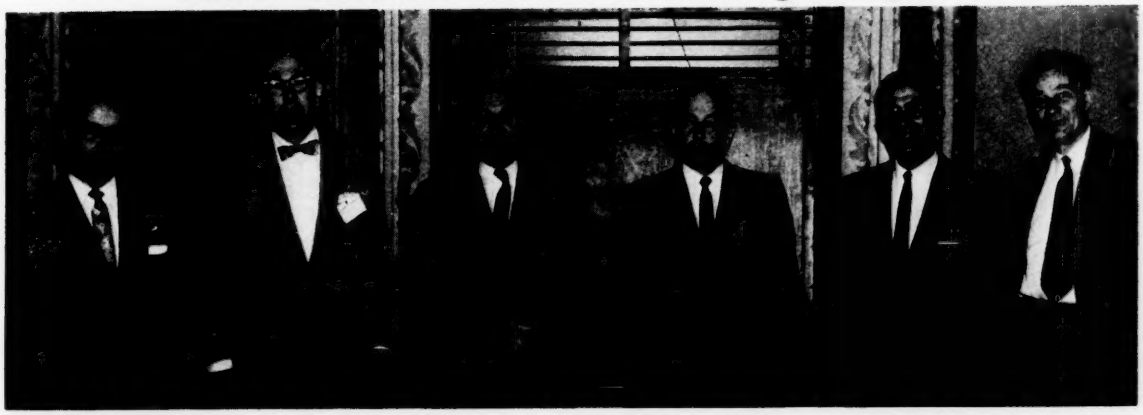
Stephen Maszy



I. C. Marsteller



Panel Discusses Factors in Casting Design



Members of the Panel Which Discussed "Important Factors in the Design of Castings" at Milwaukee Included, From Left: R. W. Eck, Eck Foundries, Inc.; E. A. Meier, Jr., Milwaukee School of Engineering, Technical Chairman; E. G. Tetzlaff, Pelton Steel Casting Co.; Richard W. Heine, Moderator of the Meeting; A. M. Herrmann, Belle City Malleable Iron-Racine Steel Castings Co.; and J. B. Caine, Grede Foundries, Inc.

Moderator: R. W. Heine
University of Wisconsin

"Important Factors in the Design of Castings" were discussed by a panel of representative foundry experts at a meeting of the **Milwaukee Chapter.** This panel of specialists was moderated by R. W. Heine, professor in the department of mining and metallurgy, University of Wisconsin.

E. G. Tetzlaff, foundry engineer, Pelton Steel Casting Co., spoke on steel castings and steel solidification fundamentals and their importance to steel casting design. A basic understanding of the solidification process in castings can aid in their design. Particular reference was made to heat removal through the mold wall which is a function of the type of mold and the casting section. Other principles discussed were volumetric contraction, progressive and directional solidification, hot spots and shrinkage cavities. The elimination of shrinkage cavities by proper risering and through the use of chills was discussed. Casting section design and its influence on centerline shrinkage and hot tears were also described.

A. M. Herrmann, superintendent of foundries, Belle City Malleable Iron-Racine Steel Casting Co., outlined the factors influencing casting design when gray and malleable irons are used. Generally speaking, gray irons are easily cast but castings section design is an important factor to consider in making sound castings.

R. W. Eck, vice-president and general manager, Eck Foundries, Inc., reiterated design consideration in connection with aluminum castings. Special emphasis was placed on risering and feeding of the casting.

J. B. Caine, consultant to Grede Foundries, Inc., spoke on the use of stress analysis in the design of castings. Mr. Caine emphasized the efficient use of material in casting design by stress analysis of the section. Illustrations were used to show how this approach can effectively increase the strength of the part.

Prof. Heine then moderated questions from the floor directed to various members of the panel. Items of particular interest were concerned with the foundrymen's technique in controlling such things as shrinkage cavities and hot spots.—**Reported by John F. Hinrichs for Milwaukee.**

Reviews High-Strength Steel Castings

C. G. Mickelson, American Steel Foundries, Spoke on "Adaptability of High-Strength Steel Castings for Dynamic Service" at Peoria. Shown are: Ralph T. Brower, technical chairman; Mr. Mickelson; and T. W. Peck, chairman

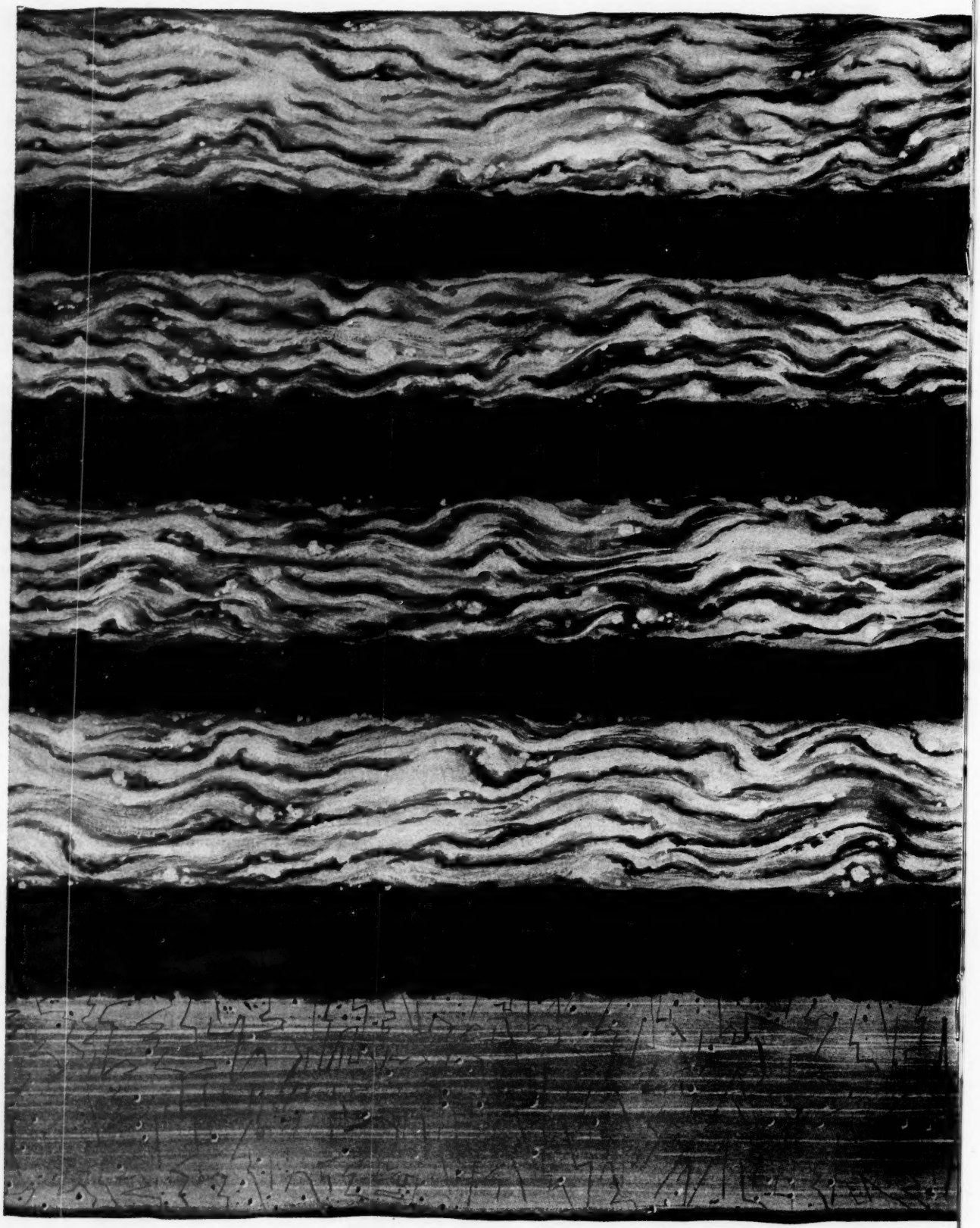
Speaker: C. G. Mickelson
American Steel Foundries

C. G. Mickelson, assistant manager, manufacturing research laboratory, American Steel Foundries, spoke on "Adaptability of High-Strength Steel Castings for Dynamic Service" at **Peoria.**

Mr. Mickelson centered his attention upon a cast steel with tensile strengths in excess of 230,000 psi. and chemical composition as follows: 0.28% carbon, 1.65% manganese, 0.40% silicon, 0.50-0.80% chromium and 0.50% molybdenum, with additions of boron and rare earths.

The rare earths were added for increased ductility and impact resistance. Several slides were shown which illustrated many of the physical properties of this steel, such as impact, hardness, tensile strength, yield strength, hardenability, etc. The steel is said to have no directional properties because it is cast. The graphs showed that there is less spread between notched and unnotched fatigue specimens when compared to other high-strength steels. Mr. Mickelson also described the steel as being relatively not notch sensitive in impact loading. Ductility was shown in a 35° bend test.

He concluded with a discussion of the results of field tests in which shovel tips were used in the taconite mines of Minnesota. The tips gave greater wear and greater resistance to breakage than other materials used in this application.—**Reported by T. M. Walton for Peoria.**



Thermal Protection Systems: No single material possesses the range of complex properties necessary to withstand the high temperatures of missile and space requirements. To solve this problem, composite materials and structures that combine the desirable characteristics of several materials, are being developed. Some of these approaches include insulating layers and heat sinks; transpiration, film or liquid-metal cooling; ablation and sublimation coatings. Shown is an artist's rendering of an insulating, composite material made up of extremely thin layers of metal and ceramics which promises to be very efficient in protecting against high-heat environments. Development of such systems is considered at Lockheed to be an integrated relation of materials, environment and design.

METALLURGY

EXPANDING THE FRONTIERS OF SPACE TECHNOLOGY

Metallurgy is typical of Lockheed Missiles and Space Division's broad diversification. The Division possesses complete capability in more than 40 areas of science and technology—from concept to operation. Its programs provide a fascinating challenge to creative engineers and scientists. They include: celestial mechanics; computer research and development; electromagnetic wave propagation and radiation; electronics; the flight sciences; human engineering; magnetohydrodynamics; man in space; materials and processes; applied mathematics; oceanography; operations research and analysis; ionic, nuclear and plasma propulsion and exotic fuels; sonics; space communications; space medicine; space navigation; and space physics.

Engineers and Scientists—Such programs reach far into the future and deal with unknown and stimulating environments. It is a rewarding future with a company that has an outstanding record of progress and achievement. If you are experienced in any of the above areas, or in related work, we invite your inquiry. Please write: Research and Development Staff, Dept. C-51, 962 W. El Camino Real, Sunnyvale, California. U.S. citizenship or existing Department of Defense clearance required.

Lockheed

MISSILES AND SPACE DIVISION

Systems Manager for the Navy POLARIS FBM; the Air Force AGENA Satellite in the DISCOVERER Program and the MIDAS and SAMOS Satellites; Air Force X-7; and Army KINGFISHER

SUNNYVALE, PALO ALTO, VAN NUYS, SANTA CRUZ, SANTA MARIA, CALIFORNIA
CAPE CANAVERAL, FLORIDA • ALAMOGORDO, NEW MEXICO • HAWAII

Saginaw Panel Covers Tool Materials

Panel Members Who Discussed "Tool and Tool Materials" at Saginaw Valley Included, From Left: R. A. Featherstone, Process Development Section, General Motors Corp.; Kenneth Lee, Prime-Way Tool & Engineering Co.; R. W. Smith, Technical Chairman; Edward Kibbett, Stupalox Div., Carborundum Co.; and Ben Burgoon, Kennametal, Inc.

Cutting tool costs may be reduced by 500% in some cases and more economical machining can be achieved although tool life is shortened. Burr-free machining is possible. These are a few of the many interesting points brought out in a symposium of "Tool and Tool Materials" held by the **Saginaw Valley Chapter.** R. W. Smith, AC Spark Plug Div., General Motors Corp., was technical chairman, and R. A. Featherstone, Process Development Section, General Motors Corp., moderator of the symposium. Panel members were E. Kibbett, B. Burgoon, Jr., and K. Lee.

Ceramic tooling was discussed by E. Kibbett, manager of the Stupalox Div., Carborundum Co. He pointed out that ceramics for mechanical applications is by no means a recent development but has been used for a number of years. Research and development on metal cutting tool applications progressed during the 1930's but was curtailed during World War II. Renewed interest and work was generated by the Korean War and the resulting threat of a tungsten shortage.

Examples were shown of how and where ceramic tooling replaced other tooling at a considerable savings. This savings resulted from increased cutting speeds, more cuts per edge, and by having multiple cutting edges per tool. Some of the examples were on short-run jobs indicating that high production is not required to achieve a savings.

As with other materials the application of ceramic materials for mechanical use should be based on their unique properties. A ceramic tool material is very hard, has good dimensional stability, is nonmagnetic, has low thermal conductivity, as well as excellent corrosion resistance. Although ceramic materials have lower strengths at room temperatures than other tooling materials, they retain their strength to higher temperatures.

Ben Burgoon, Jr., sales manager of Kennametal, Inc., spoke on carbide tools. With the development of throwaway inserts the use and usefulness of carbide tools has increased tremendously. The stresses induced by brazing the carbide-to-metal backing can be eliminated and tool life thus improved. The throwaway inserts permit more rigid support which also improves tool life.

Three recent developments in carbides have further increased its usefulness. These were enumerated by Mr. Burgoon as follows: The use of up to 12% tantalum carbide; higher hardness achieved (93-94.5 R_a) by using titanium carbide and nickel binders; better processing in the milling and refining stages has improved performance of the individual grades.

When using carbide throwaway inserts it is well to consider speeding up the cutting rate even though it results in shorter tool life. With the ease of changing tools and the relative low cost per cutting edge it is often more economical to do this.

As an interesting sidelight to his talk, Mr. Burgoon showed examples where the unique properties of carbides were utilized for other than cutting tools. These included boring bars, quills, gun drill shanks and arbors.

Kenneth Lee, a proprietor of Prime-Way Tool & Engineering Co., spoke on the use of electrical discharge machining. After discussing the basic principles involved in this operation, Mr. Lee pointed out several ways where it can be used to best advantage.

1. Machining hard materials
2. Machining delicate materials
3. To achieve burr-free machining
4. To prevent smearing
5. For minute openings
6. For cutting deep grooves

Mr. Lee discussed the electrodes used in electrical discharge machining and how they can be mounted to assure perfect alignment between mating parts. As an example, the punch retainers can be used to hold the electrodes when machining blanking dies.

Electrical discharge machining can be used very effectively for machining die cast and plastic mold dies where dimensions are critical but forging dies, with their larger tolerances, do not generally warrant the use of this process.

A question-and-answer period followed the talks.—**Reported by Homer D. Boggs for Saginaw Valley.**

Speaks on Chromizing in Birmingham

Richard Seelig, Executive Vice-President, Chromalloy Corp., Who Presented a Talk Entitled "Chromizing" at a Meeting Held by the Birmingham Chapter, is Shown with E. A. Brandler, Left, Chairman

Nominating Committee for National Officers of A.S.M.

In accordance with the Constitution of the American Society for Metals, President Walter Crafts has selected a nominating committee for the nomination of president (for one year), vice-president (for one year), secretary (for two years), and two trustees (for two years each). This committee was selected by President Crafts from the list of candidates submitted by the chapters.

The personnel is: Chairman: A. F. Sprankle (Southeast Ohio Chapter), Vanadium Corp. of America, Box 209, Cambridge, Ohio; William F. Collins (Boston Chapter), United Carr Fastener Corp., 31 Ames St., Cambridge, Mass.; Donald F. Cornish (Montreal Chapter), Anaconda American Brass Ltd., Dominion Square Bldg., Montreal 2, Que.; David R. Edgerton (Chicago Chapter), Lindberg Steel Treating Co., 1985 N. Ruby, Melrose, Ill.; William D. Gilder (Texas Chapter), Reed Roller Bit Co., Box 9219, Houston 1, Tex.; Paul A. Lauletta (Ft. Wayne Chapter), Joslyn Manufacturing & Supply Co., 1701 McKinley Avenue, Ft. Wayne 6, Ind.; Alva H. Roberson (Oregon Chapter), U. S. Bureau of Mines, Box 492, Albany, Ore.; Samuel J. Rosenberg (Washington Chapter), National Bureau of Standards, Washington 25, D. C.; and W. Leslie Worth (Savannah River Chapter), E. I. duPont de Nemours Co., Aiken, S. C.

The committee will meet during the third full week in the month of May. It will welcome suggestions for candidates in accordance with the A.S.M. Constitution, Article IX, Section 1 (b), which provides that endorsements of a local executive committee shall be confined to members of its local chapter, but individuals of a chapter may suggest to the nominating committee any candidates they would like to have in office.

The National Office has prepared a form on which to provide the pertinent information on candidates for the various positions open on the Board of Trustees. Copies of this form, entitled "Candidate for Nomination to Board of Trustees", were sent to the chairmen of each of the local chapters. Individual members and representatives of members of the Society who wish to endorse candidates for consideration are urged to utilize these forms in providing details on their candidates. Extra copies of the form may be obtained by writing Miss Evelyn Gardner, National Office, American Society for Metals, Metals Park, Novelty, Ohio.

See you All in Dallas . . . May 9-13

Gives Carnegie Lecture at Pittsburgh

N. E. Promisel (Right), Dept. of the Navy, Is Shown Receiving the Carnegie Lecture Certificate From Gilbert Soler, Chairman, at a Pittsburgh Meeting. Mr. Promisel presented a talk on "The Renaissance in Metallurgy"

Speaker: N. E. Promisel
Dept. of Navy

Members of the **Pittsburgh Chapter** heard the 12th Annual Andrew Carnegie Lecture given by N. E. Promisel, chief materials scientist of the Bureau of Naval Weapons, and director, Materials Division, Dept. of the Navy, on "The Renaissance in Metallurgy".

Mr. Promisel pointed out that throughout the various ages, going back as far as the Stone Age, man has been advancing through materials progress, periodically reaching plateaus in this progress, only to be stimulated to higher levels by new scientific achievements. We are now passing through a transition period of metallurgy with a sharp upturn in materials science and engineering taking place which should project us to a new and improved status.

This current renaissance is being brought about by the progress in basic research, in solid state physics, in interdisciplinary approaches, in processing and fabrication techniques, in new laboratory and production tools and in the interplay between design and materials application, fabrication and control of impurities. Specific examples were pointed out in these fields by the speaker. In solid state physics, he demonstrated work with ionic crystals, dislocation motion and pinning, crystal perfection with whiskers exhibiting strength in the 2.5 million psi. bracket and the control of brittle materials to improve ductility. In processing, he showed ausforming for producing steel with tensile strengths up to about 400,000 psi. In fabrication, with the introduction of InFab, a new potential for the production of such metals as tungsten, molybdenum and columbium is being realized. Ultrasonic welding was illustrated using beryllium. For laboratory tools, slides illustrated the use of the field emission microscope, the electron probe analyzer and others. For production tools, various vacuum melting techniques were described, as well as the control and significance of impurites.

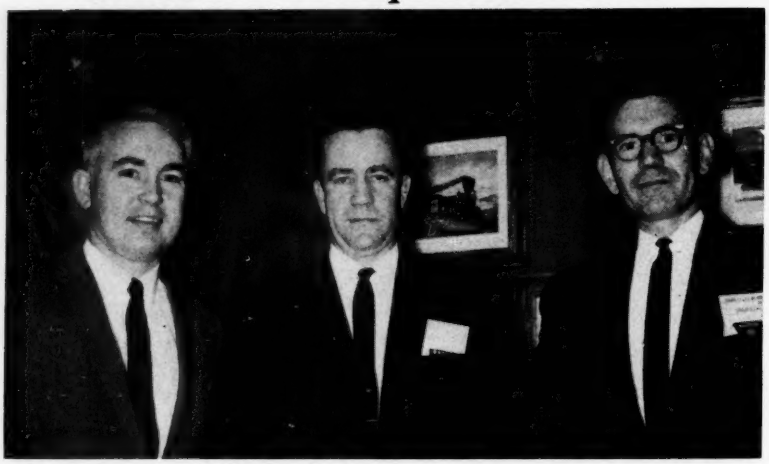
Along with these examples of technological advancements there is being created a renaissance in progressive outlook. This is evidenced in part by the great increase and expansion in research facilities in recent years. The roles of government, industry and universities were discussed from the viewpoints of the organization, planning, pattern and philosophy of comprehensive research and development programs.

The challenge of increasing material requirements is being met by a combined effort of all the necessary resources. A striking example of this was the coordinated effort in the titanium high-strength sheet development program. Similarly, a consolidation of efforts of producers, consumers, government and independent research is now being effected to meet needs for refractory metal development for the aircraft and missile programs.

The speaker concluded with a description of some major government activities to improve the nation's posture in the conduct and exploitation of materials research and development, and with some challenging remarks about the future.—**Reported by H. M. Johnson for Pittsburgh.**

Commencing with the April issue, *Metals Review* will be put into the mails by the tenth of each month. This schedule should put it into the hands of the members no later than the 15th.

Discusses Gas Equilibrium Data



W. T. Groves, Chief Metallurgical Engineer, Dana Corp., Spoke on "Gas Equilibrium Data and Its Application in Heat Treating Atmospheres" at a Meeting in Peoria. Shown are, from left: R. H. Hays, technical chairman; Mr. Groves; and C. S. Black, vice-chairman

Speaker: W. T. Groves
Dana Corp.

W. T. Groves, chief metallurgical engineer, Dana Corp., spoke on "Gas Equilibrium Data and Its Application in Heat Treating Atmospheres" at a meeting in **Peoria.**

Equilibrium data is used in heat treating to determine carbon potential and finds application in the control of surface carbon to prevent decarburization or carburization during heating, control carbon additions during carbon restoration, homogeneously carburize throughout the entire section of a part and control surface carbon concentration during gas carburizing.

Some advantages of controlling surface carbon are: to obtain maximum hardenability, reduce carbide network at grain boundaries, produce cleaner parts and provide longer life of alloy furnace parts by keeping soot at a minimum.

Mr. Groves projected slides showing that the maximum hardenability of SAE 8620 steel bars was obtained at 0.82% C.

It was brought out that it is the ratio of CO_2 with CO and H_2O with H_2 that determines the carbon potential rather than any one of these components.

Several examples were given to illustrate how equilibrium curves can be used to calculate carbon potential from the percentages of various gas components determined by orsat and dew point.

Although the calculated figures for carbon potential may vary from actual conditions they serve as a guide or starting point. Some reasons for variation may be due to the fact that equilibrium conditions rarely exist and in continuous furnaces a large flow of gases and continuous door opening cause atmosphere contamination.

The operation of automatic carbon potential control equipment as applied to continuous carburizing furnaces was discussed.—**Reported by H. L. Schmedt for Peoria.**

M.E.I. Heat Treat Short Course to be Held at A.S.M. Headquarters

The Metals Engineering Institute course, "Heat Treatment of Steel", written by George F. Melloy of the Bethlehem Steel Co., will be offered as a one-week short course at the American Society for Metals' headquarters building during the week of June 6, 1960. A limited number of sleeping accommodations at nearby Punderson State Park will be reserved on a "first come, first served" basis. Attendance at the class will also be limited to about 30. Instructors will be M.E.I. staff members.

The month of June has been selected so that individuals may take a week of their vacations for this purpose. The vacation-like atmosphere at Punderson would be suitable for the wife and children.

For further information, write M.E.I. headquarters, Metals Park, Novelty, Ohio.

Speaks on Metals at High Pressures

Speaker: H. Tracey Hall
Brigham Young University

At a meeting of the **New York Chapter,** H. Tracey Hall, director of research, Brigham Young University, spoke on his work in the extreme pressure and temperature field in a talk entitled "What Happens to Metals at 1,500,000 Psi. and 9000 F.?"

Dr. Hall reviewed laboratory developments which have permitted pressures of almost 3,000,000 psi. to be attained. Already practical for producing man-made diamonds, these techniques hold promise of giving us new, valuable work-a-day materials and perhaps exotic metals with fantastic strengths.

According to Dr. Hall, it is possible that ultra-high pressures may be able to iron out flaws and dislocations in the crystal structure of metals to bring their strength closer to theoretical levels. He also discussed new abrasive materials made through high pressures, and the possibility of "pressure treating" instead of heat treating alloys—**Reported by Bruce Fader for New York.**

H. Tracey Hall, Director of Research, Brigham Young University, Gave a Talk Entitled "What Happens to Metals at 1,500,000 Psi. and 9000° F.?" at New York. Shown are, from left: Les Seigle, chairman; Frances Clark, executive committee; Dr. Hall; and A. Zeitlin, technical chairman

CHAPTER MEETING CALENDAR

Akron	**Apr. 20**			National Officers Night
Albuquerque	**Apr. 21**		**J. S. Schneeman**	Nondestructive Testing
Baltimore	**Apr. 18**	Engineers Club	**W. S. Pellini**	Application of Materials to Thermal and Space Flight Vehicles
Boston	**Apr. 1**	MIT Faculty Club	**Bruce Chalmers**	
Buffalo	**Apr. 14**	Red Coach Inn	**E. V. Crane**	Impact Extrusion of Metals in Presses
Calumet	**Apr. 12**	Teibels Restaurant		Ladies Night
Chicago	**Apr. 11**	Laboratory Tour	**Victor F. Zackay**	New Approach to High-Strength Steels
Chicago-Western	**Apr. 14**	Argonne National Laboratory	**LaQue, DeVan, Weeks, Francis and Gulbransen**	Seminar on Mechanisms of Corrosion
Cleveland	**Apr. 4**			Welding and Heat Treating
Columbus	**Apr. 6**	Cincinnati		Tri-Chapter Meeting—Metallurgy in Space
Dayton	**Apr. 27-28**	Sheraton-Gibson Hotel		Tri-Chapter—Metallurgy in Space
Delaware Valley	**Apr. 20**		**Frank McKiernan**	Miracle of the Tin Can
Eastern New York	**Apr. 12**			Designing Materials
Fort Wayne	**Apr. 11**	Arthurs Chalet	**A. J. Lena**	Precipitation Hardenable Stainless Steels
Hartford	**Apr. 12**	Indian Hill Country Club	**F. C. Schaefer**	Bright Hardening and Brazing of Stainless Steels
Indianapolis	**Apr. 18**		**Ray W. Guard**	Statistical Methods in Materials Engineering
Inland Empire	**Apr. 19**			Field Trip
Jackson (Michigan)	**Apr. 19**	Arbor Hills Country Club		
Kansas City	**Apr. 20**			Abrasion Resistance
Long Island	**Apr. 20**	Patricia Murphys	**Henry T. Minden**	Semiconductors
Louisville	**Apr. 5**		**B. R. Queneau**	Embrittlement of Steels
Mahoning Valley	**Apr. 9**			Plant Visit
Manitoba	**Apr. 14**		**Walter Crafts**	Facing the Productivity Challenge: Men and Metals of the Next Decade
Miami	**Apr. 11**	Woodys Steak House	**L. M. Kulze**	Springs and Spring Materials
Milwaukee	**Apr. 19**	City Club	**W. E. Littmann**	Grinding of Steel
Minnesota	**Apr. 27**		**W. F. Raborn Jr.**	Polaris Missile Program
Montreal	**Apr. 4**		**Jack Klement**	Aluminum Bronze and Other Bronze Alloys
Muncie	**Apr. 12**			Student Night
New Haven	**Apr. 21**		**Claire Sawyer**	Waste Treatment Plant of New York and Tube Mills of Scovill
New Jersey	**Apr. 18**	Hotel Essex House	**William L. Martin**	Powder Metallurgy—Latest Developments
New York	**Apr. 4**	Brass Rail Restaurant	**Morris Cohen**	Student Night
North Texas	**Apr. 7**		**R. T. Cook**	Late Developments in Carbide and Ceramic Tooling
Oak Ridge	**Apr. 20**	K. of C. Hall	**J. E. Burke**	A Metallurgist Looks at Ceramics
Ontario	**Apr. 1**	Beacon Hotel	**E. C. W. Perryman**	Beryllium and Other Light Metals in Atomic Energy
Philadelphia	**Apr. 29**	Engineers Club	**Harry Kessler**	Hereditary Characteristics in the Production of Jetomic Irons
Phoenix	**Apr. 19**			Field Trip
Pittsburgh	**Apr. 14**	Gateway Plaza	**Panel**	Uses of Aluminum, Titanium and Steel in Aircraft Missiles
Purdue	**Apr.**	Purdue		State Symposium
Rhode Island	**Apr. 6**		**John Gilman**	Dislocation in Crystals
Richmond	**Apr. 12**	Downtown Club	**R. J. Raudebaugh**	Applicability of Stainless Steels to High-Temperature Service
Rochester	**Apr. 11**	Manger-Seneca Hotel	**Q. D. Mehrkam**	Modern Applications of Salt Bath Heat Treating
Rockford	**Apr. 27**	Trent Tube Co.		Plant Visit
Saginaw Valley	**Apr. 12**	High-Life Inn	**J. F. Leland**	Secrets of Cold Heating
St. Louis	**Apr. 21**	Owens-Illinois Glass Co.	**Robert Rugh**	Plant Tour
Southern Tier	**Apr. 4**		**E. S. Rowland**	Trends in Carburizing
Syracuse	**Apr. 5**	Onondaga Hotel	**A. E. Focke**	Metallurgist, the A.S.M. and the Metals Industry
Texas	**Apr. 5**		**Charles K. Donoho**	Steel Castings Quality Control
Toledo	**Apr. 14**	Maumee River Yacht Club	**R. J. Raudebaugh**	Evaluation of Materials for High-Temperature Service
Tri-City	**Apr. 12**	J. I. Case Co., Rock Island Works		Plant Tour
Tulsa	**Apr. 5**		**C. H. Lorig**	Materials for the Space Age
Upper Ohio Valley	**Apr. 10**		**George Watson**	Automation in the Metals Industry
Utah	**Apr. 27**		**Walter Crafts**	Facing the Productivity Challenge
Washington	**Apr. 18**	All-States Restaurant	**Walter Crafts**	Facing the Productivity Challenge
Western Ontario	**Apr. 22**			Ladies Night
West Michigan	**Apr. 18**			Plant Tour
Wilmington	**Apr. 13**	Fabians Restaurant	**J. E. Burke**	A Metallurgist Looks at Ceramics
Worcester	**Apr. 13**	Hickory House	**V. Lysaght**	Hardness Testing of Metals
York	**Apr. 18**	York	**H. J. Beattie, Jr.**	Metallography of High Temperature Materials

Metal Failures Topic At Baltimore

"Metal Failures Can Be Explained", according to M. A. Scheil, director of metallurgical research, A. O. Smith Corp., in a talk at **Baltimore.**

Mr. Scheil, basing his talk on reports of field failures of equipment, described the failures, investigative methods used and conclusions reached. Fatigue, stress-corrosion, low-temperature brittle and hydrogen embrittlement failures were included. Solutions ranged from minor modifications in heat treating cycles to complete material changes, and from simple to elaborate design changes.

In many cases, expensive field failures can be avoided by suitable laboratory preliminary testing. In the field, modern inspection equipment can frequently detect early signs of distress and prevent actual failures. When they do occur, Mr. Scheil recommends a simple approach—get the facts.—**Reported by J. H. Fuchsluger for Baltimore.**

Corrosion Protection Methods Defined

A. L. Spencer, E. G. Holmberg and H. T. Sumsion Are Shown at a Meeting of Santa Clara Valley Chapter at Which Mr. Holmberg, International Nickel Co., Gave a Talk on "Mechanisms of Corrosion and Protection Methods"

Speaker: E. G. Holmberg
International Nickel Co.

Santa Clara Valley Chapter members heard E. G. Holmberg, International Nickel Co., speak on "Mechanisms of Corrosion and Protection Methods".

Mr. Holmberg's talk concerned the various forms of deterioration that are caused by the combined action of corrosion and mechanical effects and by corrosion of alloy structures having metallurgical deficiencies. Steam erosion data were presented that clearly demonstrated hardness is not always an essential criterion for good erosion resistance. Research data showing the effect of varying percentages of nickel (8-77%) in an 18% chromium-iron alloy served to emphasize the need for further fundamental research to determine the role of nickel in stress-corrosion cracking phenomenon. These data revealed that 18% chromium alloys containing over 45% nickel were immune to stress-corrosion cracking in a boiling 42% magnesium chloride solution.

The more practical aspects of metal deterioration were also covered by presentation of centrifugal pump packing test data to show the cause for localized sleeve wear which frequently occurs three or four rings in from the packing follower. These data indicated that better distribution of sleeve wear will result if packing rings having decreasing degrees of hardness starting from the follower end are used.

The question period which followed Mr. Holmberg's talk indicated considerable interest in the information which he presented.—**Reported by R. N. Johnson for Santa Clara Valley Chapter.**

Talks on Impact Machining at Rockford

"Impact Machining of Steel" Was Discussed by W. W. Wishart, Verson Allsteel Press Co. He is shown with a number of chapter members

Speaker: W. W. Wishart
Verson Allsteel Press Co.

Members of the **Rockford Chapter** heard W. W. Wishart, chief metallurgist with the engineering staff, Verson Allsteel Press Co., speak on "Impact Machining of Steel".

Impact machining is the practical application of the principles of cold extrusion to the manufacture of a wide variety of piece parts that formerly had to be made by metal removal processes or hot forged. In this process, suitably tooled presses cold flow metal into the required shape with little or no conventional machining.

Mr. Wishart pointed out that successful cold extrusion depends on several factors; first, presses must be carefully selected for special deflection ratios and extra power capacity; quality control of the work material is mandatory, because otherwise the actual extrusion pressure may vary widely; and success or failure may depend on lubrication of the work material and its shape. He stated that all factors in impact machining are critical but tool design is perhaps the most important. It is important to know how metals flow plastically under pressure, how to design tools that maintain tolerances but do not fail quickly, and how much the metal can be worked per operation. Such knowledge is essential whether a short run or a high production setup are planned.

Several advantages of impact machining are: cheaper base materials can be used; greater scrap savings; improved surface finish; close tolerances; improved physical properties. Mr. Wishart showed slides on the forward extrusion process and how carbides are used for higher pressures.—**Reported by G. W. Sandstrom for Rockford.**

Upper Ohio Valley Receives Charter

Officers of Recently Chartered Upper Ohio Valley Chapter Include, Standing, From Left: F. G. Norris, H. O. Kessler, J. R. Newman and D. K. Miller. and Seated, From Left: P. C. Barr, R. L. LeVaughn and L. C. Beale

The **Upper Ohio Valley Chapter** observed its charter presentation ceremonies on National Officers Night with a dinner meeting at which A. R. Putnam, managing director A.S.M., presented the charter to Harold Kessler, chairman of the newly formed chapter.

Walter Crafts, A.S.M. President, inaugurated the new Chapter with his address on "The Productivity Challenge: Men and Metal in the Next Decade". The enthusiasm was overwhelming with 175 attending the meeting. The embryo Chapter will provide an opportunity for metals men in the Steubenville-Weirton, East Liverpool, Wheeling and Martin's Ferry areas to get together and interchange ideas and disseminate their knowledge and technical experiences.

Christened the Upper Ohio Valley, the new Chapter was the outgrowth of a few A.S.M. members who expressed their desire to formulate a local Chapter. Within one month the Chapter was conceived and approved and now boasts over 100 charter members.

Chapter officers are H. D. Kessler, chairman, Titanium Metals Corp. of America; F. G. Norris, vice-chairman, Wheeling Steel Corp.; L. C. Beale, secretary, National Steel Corp.; and P. C. Barr, treasurer, Titanium Metals Corp. The five-member executive committee is comprised of R. L. LeVaughn, Vanadium Corp. of America, J. W. Nash, National Steel Corp., D. K. Miller, Weirton Steel Corp., J. R. Newman, Titanium Metals Corp., and W. S. Copp, Wheeling Steel Corp.

Make a Date—
for Dallas . . . May 9-13

Elected by A.I.M.E.

The Metallurgical Society of A.I.M.E. has installed Carleton C. Long, director of research, St. Joseph Lead Co., as its president.

In taking office, Dr. Long stated that "research is the key to a better future for the metallurgical industry". In further remarks, Dr. Long indicated that many metallurgists are now being recognized as experts in "materials".

"Physical metallurgists", Dr. Long continued, "have gone further in discovering and defining the basic scientific principles determining the properties of metals than any other group". Because of the success in developing the science of metallurgy the same basic concepts are now being extended beyond metals and applied broadly to materials.

"Metallurgical engineers", he indicated, "are coming to realize the great advantage derived by considering their profession to be concerned with the study and application of materials, rather than metals only".

Presents Woodside Lecture in Detroit

Shown Receiving the 17th William Park Woodside Memorial Award of the Detroit Chapter Is Morris Cohen, Massachusetts Institute of Technology, Who Gave a Talk Entitled "Why Is Martensite Hard?", While D. J. Henry, Chairman, and T. E. Olsen, Technical Chairman of the Meeting, Look On

Speaker: Morris Cohen

Massachusetts Institute of Technology

Morris Cohen, Massachusetts Institute of Technology, gave the 17th Annual Woodside Lecture before the **Detroit Chapter** on the subject, "Why Is Martensite Hard?

Dr. Cohen outlined the results of a survey conducted by Albert Saveur a half century ago on this subject. Simplified, the opinions of metallurgists 50 years ago can be summarized as follows:

1—Strengthening of atomic bonds.
2—Strain hardening.
3—Solid solution hardening.
4—Precipitation hardening.

These opinions are primarily those of metallurgists today, with somewhat more modern language and definition. Dr. Cohen demonstrated that solid solution hardening is the most significant factor in the hardness of martensite and that carbide precipitation is a less important contribution. Ausforming also came in for some discussion and here the increased strength and ductility are more readily explained by the strain hardening concept.

T. E. Olsen, technical chairman, gave a short biography of Williams Park Woodside as a prelude to the Woodside Memorial Lecture. — **Reported by T. C. King for Detroit.**

Southwestern Metal Congress And Exposition Plans Go Ahead

The 2nd Southwestern Metal Congress, to be held in conjunction with the 2nd Southwestern Metal Exposition in Dallas, May 9-13, promises to be the most informative meeting of its kind ever projected for the area. Outstanding metals engineers, researchers and educators are scheduled to deliver technical papers.

T. C. DuMond, manager of Metal Congresses for A.S.M., has programmed four full days of half-day sessions in cooperation with the local technical chairman, W. H. Sparrow, supervisor of structures materials, Aeronautics Div., Chance Vought Aircraft, Inc., Dallas.

Technical sessions of the American Society for Metals will be held in the Sheraton-Dallas Hotel and the Texas Hall of State. There is no charge for attending these sessions.

Following is the tentative schedule for the technical program.

Monday, May 9, Sheraton-Dallas Hotel

COMPOSITE MATERIALS FOR HIGH-TEMPERATURE APPLICATIONS

9:00 a.m.

Metal-Metal Oxide Alloys for High-Temperature Applications, by Nicholas Grant, Massachusetts Institute of Technology, Cambridge, Mass., and K. Zwilsky, New England Materials Laboratory, Medford, Mass.

Metal-Ceramic Composites, by J. R. Tinklepaugh, Alfred University, Alfred, N. Y.

Composite Materials, by E. Scala, Avco Research and Advanced Development Div., Wilmington, Mass.

2:00 p.m.

Pyrolitic Graphite, by R. J. Diefendorf, General Electric Research Laboratories, Schenectady, N. Y.

Selection of High-Strength Carbons for High-Temperature Applications, by E. R. Stover, General Electric Research Laboratories, Schenectady, N. Y.

Structural Uses of Graphite, by Frank Anthony, Bell Aircraft Corp., Buffalo, N. Y.

Tuesday, May 10, Sheraton-Dallas Hotel

STEELS FOR HIGH-LOAD APPLICATIONS

9:00 a.m.

Crack Propagation Characteristics of Cold Rolled High-Strength Stainless Steels, by R. A. Lula, Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

H-11 Steel Application to Rocket Cases, by J. C. Hamaker, Jr., Vanadium-Alloys Steel Corp., Latrobe, Pa.

Steels Heat Treated to 260,000 Psi. for High-Load Applications, by F. D. Weaver, Southwestern Industrial Electronics Co., Div. of Dresser Industries, Houston, Tex.

Tuesday, May 10, Texas Hall of State Fair Grounds

NEW FRONTIERS IN WELDING AND BRAZING

2:00 p.m.

Developments in Carbon-Dioxide Welding Processes, by J. P. Koss, A. O. Smith Corp., Milwaukee, Wis.

Honeycomb Brazing, by H. R. Wiant, Avco Research and Advanced Development Div., Wilmington, Mass.

Pipe Line Welding, by Robert S. Ryan, Columbia Gas System Service Co., Columbus, Ohio.

Wednesday, May 11, Sheraton-Dallas Hotel

FAILURE ANALYSIS

9:00 a.m.

Die and Tool Failures, by R. F. Spillet, Crucible Steel Co. of America, Sanderson Halcomb Works, Syracuse, N. Y.

Special Heat Treating Techniques, by J. Turk, Paulo Products Co., St. Louis, Mo.

Overcoming Surface Vulnerability of High-Strength Steels Through Shot Peening, by Henry Fuchs, Metal Improvement Co., Los Angeles, Calif.

Wednesday, May 11, Texas Hall of State Fair Grounds

2:00 p.m.

TESTING AT HIGH TEMPERATURES—OVER 2000° F.

Measurement of Thermodynamic and Physical Properties, by C. L. Rosen, A. A. Hasapis and J. W. Wholley, Avco Research and Development Div., Wilmington, Mass.

Measurement of Thermal Properties Above 2000° F., by W. J. Parker, U. S. Naval Radiological Defense Laboratory, San Francisco, Calif.

Methods of High-Temperature Measurement, by H. J. Kostkowski, National Bureau of Standards, Washington, D. C.

Thursday, May 12, Hotel Adolphus

CASTINGS FOR HIGH-TEMPERATURE AND CORROSIVE SERVICE

9:00 a.m.

Application of Shell Molding to Valve Bodies, speaker from Oklahoma Steel Casting Co., Tulsa

Walter Crafts, A.S.M. President (Center) Is Shown Discussing the Southwestern Metal Show With Wm. A. Rosamond, (Left), Manager, Industrial Dept., Dallas Chamber of Commerce, and C. J. Watson, Assistant General Manager, Ft. Worth Chamber of Commerce

A New Ceramic Mold Method for High-Temperature Castings, by Herbert Greenewald, Chance-Vought Aeronautics, Dallas, Tex.

Investment Casting of Parts for High-Temperature Service, speaker from Michigan Steel Castings Co.

2:00 p.m.

Additional Castings Papers Plus Panel (Tentative)

Metal Exposition Plans Progress

The greatest congregation of metals men in the history of the Southwest appears assured for the 2nd Southwestern Metal Congress and Exposition, May 9-13, in Dallas. Heavy attendance is expected from within a 600-mile radius of this Metal Show city, setting for the "Metalworking Round-Up—Southwest Brand".

The Southwestern Metal Show, states Allan Ray Putnam, A.S.M. managing director, will reflect important developments in metalworking equipment and techniques of immediate interest to the metal industry of the Southwest. Latest advances in metals technology will be presented during the Metal Show's five-day program, expressly geared to immediate application in the region. Expectations are that the bulk of the attendance will be drawn from the entire state of Texas, as well as New Orleans, Birmingham, St. Louis, Kansas City, Wichita, Tulsa, Los Alamos, Albuquerque, Pueblo, Denver and intermediate points.

Two Texas metals men, both members of the Texas Chapter, are providing Exposition information locally. They are Robert K. Sorensen, sales engineer, Haynes Stellite Co., Houston, and Fred B. McKimball, president, Southwestern Gage Co., Dallas. Stephen Maszy, vice-president, Perzy Heat Treat, Inc., Arlington, North Texas chairman, heads the host committee.

Thousands of admission-invitations for the event are being distributed to area technical society members and customers and clients of exhibitors. Admission-invitations may be obtained at the doors of the exposition for a nominal registration fee of $1.00.

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers: c/o A.S.M., Metals Park, Novelty, Ohio, unless otherwise stated.

POSITIONS OPEN

East

SENIOR METALLURGICAL ENGINEER: Young man to conduct research and development in advanced areas of powder metallurgy and high-temperature materials development. Should be capable of supervising work of others and writing reports. This is a newly created key position with the corporation. Salary $8000-10,000. Address reply to: Storchheim Research & Development Corp., 34-32 57th St., Woodside 77, N. Y.

DESIGN ENGINEER: Well-established manufacturer of gas-fired industrial heat treating equipment and appliances desires a designer and engineer with at least ten years experience with similar company. Must be experienced draftsman capable of supervising drafting and engineering department. Send resume of education, experience, salary requirements and references. Box 3-5.

TEACHING AND RESEARCH, METALLURGICAL ENGINEERING: Expanding university program provides unusual opportunity for position combining teaching and research. Rank and salary open. Work in fields of X-ray diffraction, electron microscopy, metallurgy. Experience in these fields and Ph.D degree desirable. Apply: Dean E. C. Easton, Rutgers University, New Brunswick, N. J.

HEAT TREAT METALLURGIST: Recent metallurgical graduate for commercial heat treating plant in New England. Excellent opportunity for practical engineer to advance into supervisory and management position. Box 3-140.

METALLURGIST: For research engineering department. College graduate with three to five years experience in metallurgical laboratory. Experience in automotive industry highly desirable. Position entails metallurgical analyses, physical testing and report writing. Salary commensurate with experience. Send resume to: H. W. Shidemantle, Research Dept., Mack Trucks, Inc., 1120 S. 2nd St., Plainfield, N. J.

NUCLEAR METALLURGIST: Must have training or experience in one or more of the metallurgical problem areas of nuclear reactor power systems. Advanced degree preferable. Would have responsibility for following and advising on all metallurgical aspects of reactor power system projects of the Army Nuclear Power Program. Salary commensurate with experience. Send resume or government form 57 to: R. G. Oehl, Chief, Technical Evaluation Branch (Army Reactors), Division of Reactor Development, U. S. Atomic Energy Commission, Washington 25, D. C.

POWDER METALLURGIST: For research and development work with stable growing organization devoted to production of high-quality powder metallurgy mechanical components. A number of interesting projects await follow-through by the right man. Please contact: Dixon Sintaloy Inc., 535 Hope St., Stamford, Conn., Attention: President.

METALLURGICAL ENGINEER: To be responsible for material specifications and heat treat specifications, with emphasis on ferrous physical metallurgy of highly stressed gears and other components of small high-speed mechanisms. Work with research, development and manufacturing engineers; also factory foremen. Opportunity to work with some plastic components, rubber components and product lubrication problems. Minimum of four years experience required. Send resume to: G. W. McCarty, Vice-President, Research and Development, The Black & Decker Mfg. Co., Towson 4, Md.

West

ASSISTANT PROFESSOR: To teach metallurgical thermodynamics and kinetics. The qualified applicant will have a new or recent Ph.D. in metallurgy but must have undergraduate training in another field. Teaching duties commence September 1960. Apply to: Head, Dept. of Metallurgy, Montana School of Mines, Butte, Mont.

RESEARCH METALLOGRAPHER: Graduate metallurgist to interpret aluminum metallurgical structures. Good opportunity to learn. Trained technician help available, ample opportunity to publish, to attend technical society meetings and visit fabricating plants. Generous insurance, retirement, medical and savings benefits. Relocation costs paid. Write to: F. M. Krill, Dept. of Metallurgical Research, Kaiser Aluminum & Chemical Corp., Spokane 69, Wash.

Midwest

CASTINGS SALES ENGINEER OR MANAGER: Graduate engineer, 25 to 35, with knowledge of foundry processes and casting design. Some experience in selling quality iron or steel castings preferred. Excellent opportunity with medium-size, progressive company making high-quality iron castings. Box 3-10.

METALLURGIST: Experienced in vacuum and induction melting. Investment casting company in Western Michigan. Salary $7500-9000 and profit sharing. Box 3-15.

LAWRENCE RADIATION LABORATORY has Staff Positions Open

. . . For research and development in the fields of nuclear explosives and high temperature nuclear reactors.

• METALLURGIST, Ph.D. . . . to assume technical direction of applied research metallurgy group. Broad theoretical and practical background in physical metallurgy required. Experience in metallurgy of beryllium, thorium, uranium, plutonium is desirable. Current problems include:

1. Basic studies on alloy systems; TTT diagrams, phase diagrams, mechanical and physical properties, and recrystallization.
2. Deformation of metals and ceramics at high temperature; deformation of metals at high strain rate.
3. Corrosion mechanisms and coating development for corrosion protection.

• **METALLURGISTS,** B.S.—Ph.D. . . . Preferably with some ceramics background. Work involves mechanical property measurements at high temperatures of refractory metals, oxides, and intermetallics (creep, rupture, etc.) and development of oxidation resistant coatings. Experience in metallurgy of materials used in nuclear technology required.

• **SENIOR WELDING ENGINEER,** B.S.—M.S. . . . to develop methods for welding or brazing materials for nuclear applications in special forms and shapes.

U. S. CITIZENSHIP REQUIRED

Please send confidential resume to Mr. J. E. Beckham, Personnel Department.

LAWRENCE RADIATION LABORATORY
(Livermore Site)

P. O. BOX 808 K

LIVERMORE, CALIFORNIA
(One hour from downtown San Francisco)

METALLURGICAL ENGINEER: With five to ten years experience, preferably with background in foundry or casting shop, ferrous or nonferrous; to concentrate on metallurgical area in research and development group for growing medium-size manufacturer specializing in electric melting equipment; concerned primarily with product development and application studies. Salary commensurate with experience and ability. Liberal employee benefits. Box 3-20.

SENIOR RESEARCH SCIENTIST: In physical metallurgy. Opportunities exist for metallurgists for research in alloy development, casting, forming, metal spraying, electroforming, physical metallurgy and mechanical metallurgy. If interested, contact: Harold F. Zink, Owens-Illinois Technical Center, 1700 N. Westwood Ave., Toledo, Ohio.

POSITIONS WANTED

MANAGEMENT METALLURGIST: Desires position as director of metallurgy or quality control in metalworking industry. Over 15 years research, development, production and managerial experience in turbines, rockets, precision instruments, alloy castings and molten metal technology. Familiar with laboratory management, governmental contract practices and proposal preparation in materials field. Age 38. Box 3-25.

EQUIPMENT WANTED — Used Microhardness Tester in Good Condition. Write: Box 3-135, Metals Review

METALLURGIST
LATER SALES to $7200
Recent Graduate. Cold finished steel bar mill. Service, contact distributors and industry after training. Hdqtr. Chicago. Unusual opportunity. Employer will pay our placement fee. Contact Ralph Violl.
GLADER CORPORATION
(Certified Personnel Service)
110 S. Dearborn St. Chicago 3, Ill.
PHONE: Central 6-5353

METALLURGIST: WANTED
Well established California forging firm desires metallurgist familiar with aircraft and missile requirements. Forging experience necessary. All correspondence confidential. Salary open. Please send complete resume to:
Box 3-130, Metals Review

GAS • OIL • ELECTRIC
DIRECT FIRED OR ATMOSPHERE CONTROLLED

Production Heat Treating Equipment

FOR ANY OF THESE PROCESSES:

ANNEALING • BRAZING • CARBURIZING
CARBO-NITRIDING • FORGING • CARBON-RESTORATION • HARDENING • SINTERING • FORGING • NORMALLIZING • TEMPERING

HOLCROFT & COMPANY

6545 EPWORTH BLVD. DETROIT 10, MICHIGAN
43 YEARS OF ENGINEERING LEADERSHIP

RESEARCH METALLURGISTS AND MECHANICAL ENGINEERS

ARE NEEDED BY

MELLON INSTITUTE PITTSBURGH, PENNSYLVANIA

Group leadership positions available in both fields. Ph.D. and up to 3 years applicable experience preferred. Also several openings exist at Research Associate, M.S., and Research Assistant, B.S. levels. Studies involve high-strength ferrous alloy development and adaptation of alloys to advanced missile component requirements.

Metalworking, welding or other joining techniques, physical testing and similar experience in industry or research required.

Send resume to Professional Relations Office, Mellon Institute, Pittsburgh 13, Pa.

METALLURGICAL ENGINEER: M.S. degree, age 30, veteran, married, family. Five years experience in research and development in automotive and aircraft fields. Resume sent on request. Box 3-30.

MECHANICAL ENGINEER: Ph.D., age 37, married, five years industrial and eight years teaching experience. Now associate professor of mechanical engineering at one of the Big Ten universities. Fields include materials and processing, plastic flow of metals, theoretical and experimental stress analysis. Looking for industrial research or professional teaching position on East or West Coast. Box 3-35.

METALLURGICAL ENGINEER: B.S.Met.E., physical metallurgy. Aggressive materials research engineer with metals, hard metals and ceramics background. Experience in vacuum design, powder metallurgy techniques, physical properties measurements and operations over 4000° F. Supervisory experience. Desires research and/or development position with good growth potential. Age 25, family, U. S. Air Force officer. Box 3-40.

METALLURGIST: With 12 years diversified experience in quality control, nondestructive testing, welding, laboratory, supervision, heat treat and surface treatment. Last four years as head of department. Interested in medium-size firm engaged in production. Resume on request. Box 3-45.

METALLURGICAL ENGINEERING STUDENT: Desires summer employment in some phase of metallurgical engineering or sales. Will complete degree in June 1961. Available June 15 to Sept. 20, 1960. Will relocate anywhere in Western Hemisphere. Box 3-50.

CHEMICAL ENGINEER: B.S. degree, now attending law school. Desires position with opportunity to advance to patent department. Will relocate anyplace within commuting distance of accredited law school. Two years metallurgical experience with large steel company in customer service department. Resume sent on request. Box 3-55.

MACHINE DESIGNER: Age 42, now chief for small, timid, oil field service company, wants similar job with braver concern. Administrative ability, good work record in design and development field. $10,000. Southwest. Box 3-60.

METALLURGICAL ENGINEER: B.S. degree, age 33, family. Seven years diversified experience in wire, bar, strip mill and aircraft accessories plants. Research and development work involving heat treating, welding, powder metallurgy, high-temperature metals, testing, customer complaints and product development. Desires development position in process work and manufacturing. Will relocate. Resume available. Box 3-65.

METALLURGIST: B.S. in metallurgy, graduate study, age 28, single. Over six years experience in development, selection and specification of metallic materials and processes, failure analysis, trouble shooting, metallographic investigation. Desires position of responsibility and growth within commuting range of New York City with small to medium-size company. Salary $9000. Box 3-70.

SALES ENGINEER: B.S. degree, married, family, age 32, with seven years industrial sales experience. Mill and warehouse background, primarily in stainless steel and high-nickel alloys in all forms. Familiar with Middle Atlantic states. Free to travel or relocate. Box 3-75.

METALLURGICAL ENGINEER: B.S. and M.S. degrees, age 30. Experience in aluminum, CCP casting and melting and quality control. Heat treatment of steel in all areas. Desires challenging position as supervisor or position with this potential. Present income $9600. Box 3-80.

HEAT TREATING ENGINEER: Age 39, with 20 years experience and education in toolroom and production heat treating, both private industry and commercial. Diversified experience in light-gage ferrous and nonferrous fabrication, welding, tooling and processing, quality control, machine design and trouble shooting. Box 3-85.

MANAGEMENT-LEVEL METALLURGIST: Knows research, development, trouble shooting. Over half decade experience in supervisory positions in addition to previous top-notch engineering work. Experienced with high-temperature alloys, cast iron, steels, aluminum and reactive metals over broad range of applications. Mid-30's, M.S. degree, publications. Box 3-90.

MATERIALS-METALLURGICAL ENGINEER: B.S., M.S. degrees, age 48, married, family. Experience in polyurethane foams,

METALLURGIST

Interesting position open in the Metallurgy Department of a large industrial materials research laboratory for a metallurgical engineer with 3-5 years experience, preferably in high-temperature work, to apply metallurgical principles to the development of cermet materials. Replies held in confidence.

Reply to:

Box 3-120, Metals Review

MANAGER OF MATERIALS Research and Development

New position responsible for initiation and management of Research and Development projects in the areas of metallurgy, ceramics and organic materials. Will also act as consultant to design engineering and fabricating departments of this major national company with centralized Research and Development laboratories located in midwest.

Scope will include supervision of preparation of process specifications, solution of fabrication problems and service failure investigation.

Candidate should possess 5 years experience as a materials and process Engineer and/or experience in Materials Research and Development. Educational background should include advanced degrees or equivalent experience.

Send complete resume to Box 3-125, Metals Review. All replies treated in confidence.

CHALLENGING POSITIONS AVAILABLE

Vacancies exist in our rapidly growing Technical Division for the following positions:

SUPERVISORY POWDER METALLURGIST —To organize and coordinate an integrated research program covering the preparation and compaction of metal powders. Must have a minimum of five years experience in a related field.

PROJECT ENGINEER—To carry out specifically assigned projects involved in a beryllium powder metallurgy program. Must have a minimum of two years experience in a related field.

SENIOR TECHNICIAN—To perform various duties within the powder metallurgy section pertaining to attritioning, die compaction, furnace operation and product evaluation. This is a responsible position requiring a person with a minimum of five years experience in powder metallurgy operations.

Challenging projects, liberal company benefits, and a bright future are available to qualified applicants. Please send complete resume in confidence to:

Mr. Richard M. Quimby,
Personnel Director
The Beryllium Corporation
P. O. Box 1462
Reading, Pennsylvania

potting, encapsulation, corrosion, ferrous and nonferrous alloys, electrochemistry, technical writing, testing, plant and quality control. Present salary $10,000. Change necessary due to child's health. California, New Mexico, Arizona, Florida only. Available July 1, 1960. Box 3-95.

METALLURGIST: Tufts College and M.I.T. graduate, age 55, experience in alloy development, high-temperature materials, precision casting, including all phases of heat treating, mechanical and physical testing, customer complaints, report writing and specification writing. Limited to Chicago area. Box 3-100.

METALLURGICAL ENGINEER: B.S. degree, married, age 28. Seven years experience with large steel company in metallurgical quality control of openhearth and blooming mill practices. Desires opportunity in sales engineering or production field. Will relocate. Box 3-105.

How Can You Economize on Machine Tool Costs?

A serious problem faced by today's machine shops, large and small, is costs. Knowledge of newer methods and techniques becomes all-important

Lack of basic machine tool knowledge is hitting where it hurts most: in the pocketbook. Established, time-honored methods of machining, and old standby tool steel compositions are passing out. *Foremen or plant superintendents are the men who can make or break a machine shop economically.* This is true not only in the all-important missiles field, but also in the every day machining problems that come up.

Detailed Specific Knowledge Is Often Lacking

Like a doctor who never stops learning about new techniques, new serums and antibiotics, so a plant foreman, superintendent, or even the machinist himself must keep abreast of the fast-changing technology in metals and machining of metals. What was true yesterday may not be true today.

Detailed knowledge of the principles and practices of machining, tool steel selection, cutting speeds, lubricants, etc., is invaluable to the plant owner. The remarkable fact is that so many owners have not kept up with even the basic changes in the metal-cutting industry. For instance, there is a definite relationship between cutting speed and tool life. Precise knowledge of the condition of the metals to be machined and the capacity of the tool to do the job might determine 1) whether the job can be speeded up without the expense of using more cutting tools or 2) whether the job should be slowed down for accuracy at the expense of labor and lost machine time. Specific knowledge might spell the difference between profit and loss on this job.

Many short-lived cutting tools are expensive. Is it worth the money to use higher grade tools? Is the down-time of the machine more costly? Does the total job warrant it? Knowledge of the precise relationship between tool cost, down-time and labor may be the difference between profit and loss.

Importance of Tool Knowledge to Foremen and Machinist: How This Knowledge Effects the Economic Picture of Foreman, Machinist and Plant Owner.

Many shops base payment schedules for foremen on the overall efficiency of the shop. Machinists are often paid on a piece basis, Obviously, then, both foreman and machinist stand to gain from the specific knowledge of tool cost, tool life, warpage, cutting speeds, effects of heat treatment, internal stresses and related items.

American Society for Metals Notes Need for Information

Aware that this particular field is not satisfactorily covered in articles and books, and doubly aware of how important it is to large and small shops to be able to get these facts in understandable form, the ASM has directed its educational division, Metals Engineering Institute, to add a new course to its twenty-three home-study and extension studies. The new course is Principles of Machining.

Written by William R. Backer, MS., machine research engineer for the Norton Co., of Worcester, Massachusetts, the course covers the following 15 separate lessons: The Machine Tool; What Happens When Metal Is Cut; Effects of the Cutting Process; Cutting Tools; Force, Work and Power in Machining; Tool Life-measurement and Control; Machinability of Metals; Machinability Versus Microstructure; The Economics of Machining; Cutting Fluids; Surface Quality; Turning; Milling; Drilling; Grinding.

This new Machining Course is only one of 24 home-study courses currently being offered by The Metals Engineering Institute. Specific information on the Machining course or on any of the others may be had by writing Metals Engineering Institute, Dept. F. Metals Park, Novelty, Ohio, or by contacting your local ASM Chapter.